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FM 6-96

DEPARTMENT OF THE ARMY FIELD MANUAL

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280-mm GUN T131

ON

CARRIAGE T72

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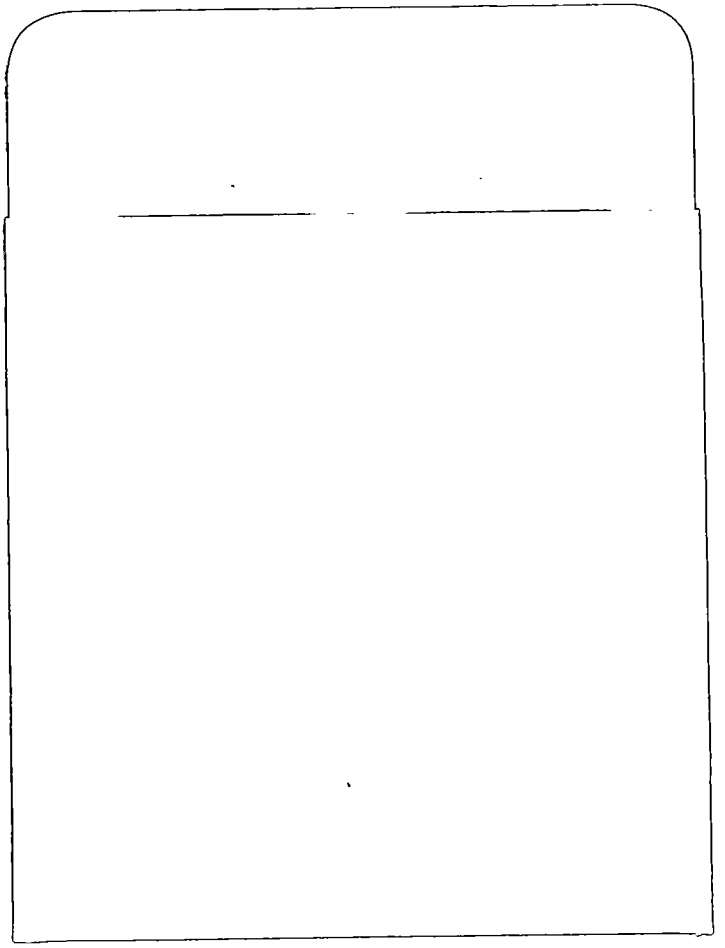


FIELD MANUAL No. 6-96
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *9 July, 1954*

280-MM GUN T131 ON CARRIAGE T72

		Paragraphs	Page
CHAPTER 1.	GENERAL	1–4	4
2.	ORGANIZATION	5, 6	10
3.	SECTION DRILL		
Section I.	General	7, 8	12
II.	Preliminary commands and formations	9–14	13
CHAPTER 4.	PREPARING THE GUN FOR FIRING AND TRAVELING		
Section I.	Preparations for firing	15, 16	22
II.	Preparations for traveling	17, 18	24
CHAPTER 5.	DUTIES IN FIRING		
Section I.	General	19, 20	43
II.	Duties of chief of section	21–36	49
III.	Duties of gunner	37–47	56
IV.	Duties of cannoneers	48–72	67
CHAPTER 6.	TECHNIQUES AND SITUATIONS THAT REQUIRE SPECIAL ATTENTION	73–94	76
7.	BORESIGHTING		
Section I.	General	95–98	99
II.	Testing target method	99–102	101
III.	Distant aiming point method	103, 104	104
IV.	Aiming circle method	105–110	105
V.	Standard angle method	111–114	117

*This manual supersedes FM 6-96, 22 July 1952.

		Paragraphs	Page
CHAPTER 8.	BASIC PERIODIC TESTS		
Section I.	General	115–117	125
II.	Test of gunner's quadrant	118–122	127
III.	Test of elevation quadrant	123–126	130
IV.	Tests for telescope mount M30 and panoramic telescope	127–133	131
V.	Fuze setters	134–136	135
CHAPTER 9.	MAINTENANCE AND INSPECTIONS	137–146	137
10.	DECONTAMINATION OF EQUIPMENT	147–150	142
11.	DESTRUCTION OF EQUIPMENT	151–154	145
12.	SAFETY PRECAUTIONS	155–160	147
13.	TRAINING		
Section I.	General	161–164	150
II.	Minimum training schedule	165–167	151
CHAPTER 14.	TESTS FOR QUALIFICATIONS OF GUNNERS		
Section I.	General	168–175	157
II.	Tests, indirect laying, deflection only	176–180	160
III.	Test for displacement correction	181–185	163
IV.	Test for measuring deflection	186–190	165
V.	Tests for laying for elevation with elevation quadrant	191–195	167
VI.	Test for laying for elevation with gunner's quadrant	196–200	168

	Paragraphs	Page
Section VII. Test for measuring site to mask	201–205	169
VIII. Test for measuring elevation	206–210	171
IX. Test and adjustment of sighting and fire control equipment	211–215	172
X. Test for materiel	216–220	177
APPENDIX REFERENCES		180
INDEX		184

CHAPTER 1

GENERAL

1. Purpose and Scope

This manual is a guide to assist commanders in developing the gun sections of 280-mm gun firing batteries into efficient, smooth-working teams that have a sense of discipline which will impel them to operate effectively under the stress of battle. This manual prescribes individual duties and section drills, inspection and maintenance drills, tests and adjustments for sighting and fire control equipment, safety precautions, and references to instructions for the decontamination and destruction of equipment. No attempt to describe duties of platoon headquarters and ammunition section personnel is set forth except as such duties relate directly to the work of the gun section.

2. Definitions and Terms

a. Gun. Throughout this manual the term *gun* is used generally to include the carriage.

b. Section. Tables of organization and equipment prescribe the *personnel* and *equipment* comprising each section of a battery (figs. 1 and 2). In this manual the term *section* is often used to designate *only the personnel* required to serve one gun and its equipment. As illustrated in figure 1,

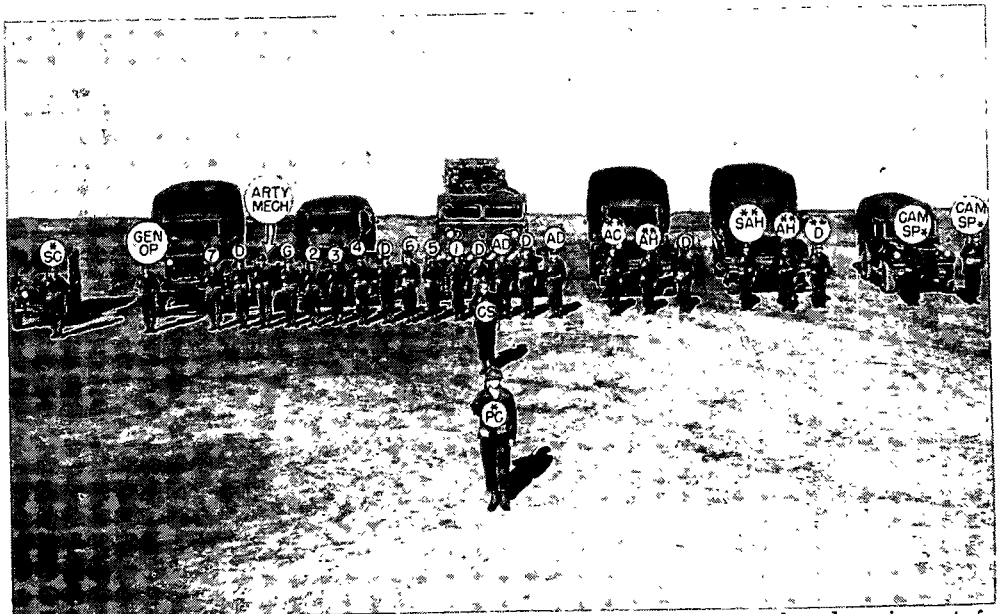


Figure 1. The 280-mm gun section and associated operational personnel and equipment from platoon headquarters and ammunition section.

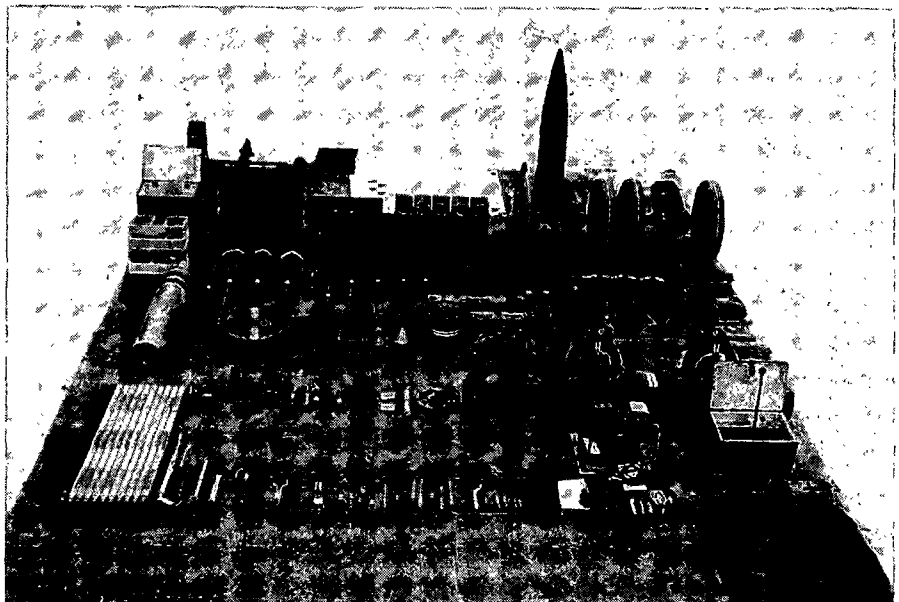


Figure 2. A method of displaying items of section equipment of the 280-mm gun.

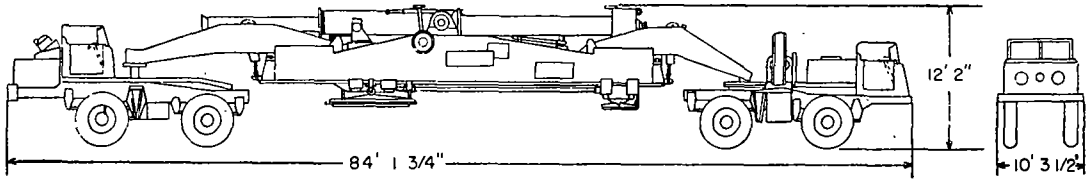


Figure 3. 280-mm gun clearance measurements.

in addition to the gun section, the personnel required to serve a gun include members of the platoon headquarters and the ammunition section (* indicates platoon headquarters personnel; ** indicates ammunition section personnel).

c. Limbered. The 280-mm gun is limbered when it is between the transporters secured in traveling position.

d. Unlimbered. The 280-mm gun is unlimbered when it rests on the ground and is not supported by the transporters.

e. Front. For the purpose of conducting drills prescribed herein, the front of a section, gun limbered, is the direction in which the transporters move forward; with the gun unlimbered, the front is the direction in which the muzzle points. However, for determining the right or left of the gun, limbered or unlimbered, the front is the direction in which the muzzle points.

f. Right (Left). The direction right (left) is the right (left) of one facing the front.

g. "A" Unit. "A" unit is the front (breech end) transporter.

h. "B" Unit. "B" unit is the rear (muzzle end) transporter.

i. In Battery. A gun is said to be in battery when it is in its normal firing position.

3. Description of Equipment

To avoid accidents caused by exceeding the size limitations of the weapon in traveling position, all members of the section should be familiar with the necessary clearance measurements

shown in figure 3. For further details pertaining to capabilities, see TM 9–338–1.

4. References

Publications pertaining to the 280-mm gun T131, 280-mm gun carriage T72, transporters T10, and auxiliary equipment, covering related matters not discussed in detail in this manual, are listed in the appendix.

CHAPTER 2

ORGANIZATION

5. Composition of Gun Section

a. The gun section consists of section personnel, a 280-mm gun, and auxiliary equipment (figs. 1 and 2).

b. The personnel of the gun section consists of—

(1) A chief of section (CS).
(2) A gunner (G).
(3) An artillery mechanic (arty mech).
(4) An assistant gunner (No. 1).
(5) Six cannoneers, numbered 2 through 7.
(6) A power generator operator (gun op).
(7) Five prime mover drivers (D).
(8) Two prime mover driver assistants (AD).

c. Section equipment is listed in SNL's appropriate to the weapon and unit and in T/O&E 6–537A.

6. Generol Duties of Personnel

a. Chief of Section. The chief of section is the noncommissioned officer in command of the entire section and, as such, is responsible to the platoon commander for—

(1) Training and efficiency of personnel.
(2) Performance of duties listed under sec-

tion drill, duties in firing, testing and adjustment of sighting and fire control equipment, and inspection and maintenance of all section equipment.

(3) Observance of safety precautions.

(4) Preparation of field fortifications for protection of equipment, ammunition, and personnel.

(5) Camouflage discipline; local security; and radiological, biological, and chemical security discipline.

(6) Maintenance of the gun book.

(7) Police of the section area.

b. Gunner. The gunner is the assistant to the section chief in carrying out the duties specified in *a* above. The gunner's specific duties are prescribed in the appropriate chapters of this manual.

c. Cannoneers. Cannoneers perform duties as listed in this manual, and any other duties that the chief of section prescribes.

d. Drivers. The drivers primary duties are driving their respective vehicles. They also perform maintenance and such other duties as are prescribed by this manual, and by the training manuals pertaining to their vehicles, or as may be assigned by the chief of section.

CHAPTER 3

SECTION DRILL

Section I. GENERAL

7. Objective

The objective of section drill is the attainment of efficiency: Precision coupled with high speed.

8. Instructions

a. To develop maximum efficiency and to prevent injuries to personnel and equipment, the drills prescribed in this manual must be observed. Section drill should be conducted in silence except for commands and reports. The section must be drilled until reactions to commands are automatic, rapid, and efficient.

b. Mistakes are corrected immediately. Each member of the section must be impressed with the importance of reporting promptly to the chief of section any mistakes discovered after the command to fire has been given. The chief of section will report such mistakes immediately to the platoon commander.

c. Battery officers supervise the drill to insure that instructions are carried out and that maximum efficiency is obtained.

d. Duties should be rotated during training so that each member of the section can perform all the duties within the section. In addition, bat-

tery overhead personnel not assigned specific duties during drill periods should be trained in the fundamentals of section drill in order that they will be capable of functioning with a gun section if required.

Section II. PRELIMINARY COMMANDS AND FORMATIONS

9. To Form Section

a. To Fall In. The chief of section takes his post. On the command of execution the section forms in two ranks at close interval centered on and facing the chief of section at a distance of 3 paces (fig. 4). Higher numbered cannoneers, if present, form in order between No. 7 and the artillery mechanic. The chief of section may indicate in his preparatory command the place and direction the section is to form. At the first formation for a drill or exercise, the caution, "As gun section(s)," precedes the command. The commands are FALL IN, or 1. IN FRONT (REAR) OF YOUR PIECE(S) (VEHICLE(S)), 2. FALL IN, or 1. ON THE ROAD FACING THE PARK, 2. FALL IN. Execution is as follows: The gun section moves at double time and forms at close interval, at attention, guiding on the gunner (fig. 4). To execute IN FRONT (REAR) OF YOUR GUN the section falls in as shown in figure 5.

b. To Call Off. The section being in formation, the command is CALL OFF. At the command, all personnel in ranks except the gunner and the driver to his rear execute eyes right.

The section then calls off in sequence, "Gunner," "1," "2," "3," "4," "5," "6," "7," "Mech," "Driver," "Driver," (assistant drivers call out "Driver"), "Gen Op." As each man calls out his designation he turns his head and eyes smartly to the front.

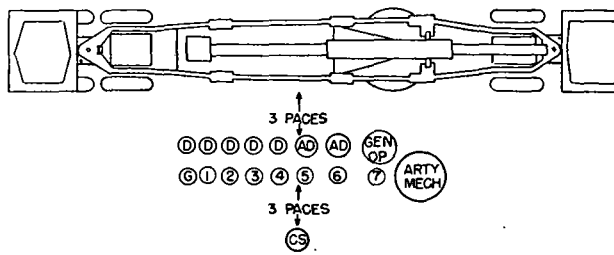


Figure 4. Gun section in formation to the right of the gun facing away from the gun.

10. Posts of the Section

The command is 1. CANNONEERS, 2. POSTS. The command is general and is applicable whether the section is in or out of ranks, at a halt or marching. All movements are executed at double time and are terminated at the position of attention. Higher numbered cannoneers, if present, take posts as prescribed by the chief of section.

a. Dismounted. The personnel shown in figure 6 move to posts as indicated. All personnel shown are alined 2 feet outside the transporter wheels and facing to the front. Other section personnel take posts as directed by the chief of section. The chief of section posts himself where he can best supervise the drill.

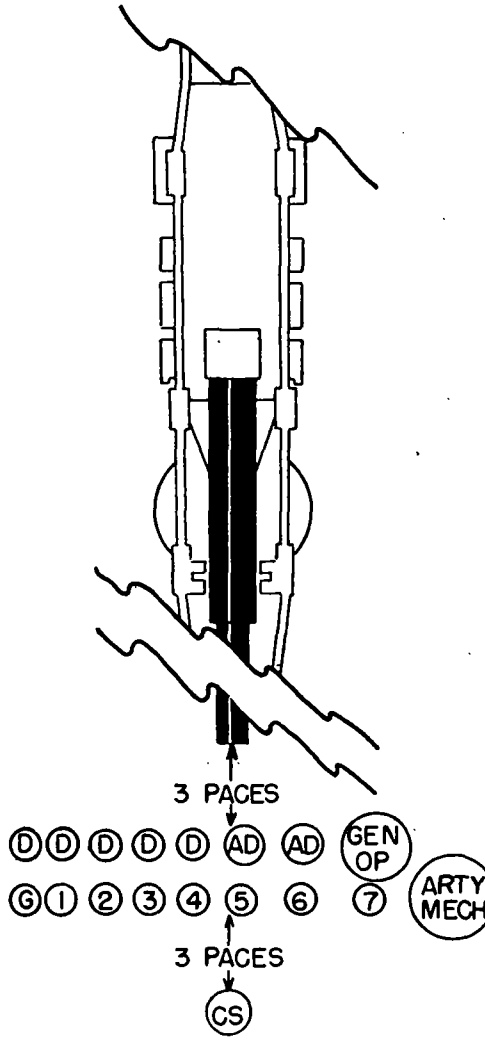


Figure 5. Section formed in front of its gun facing away from the gun.

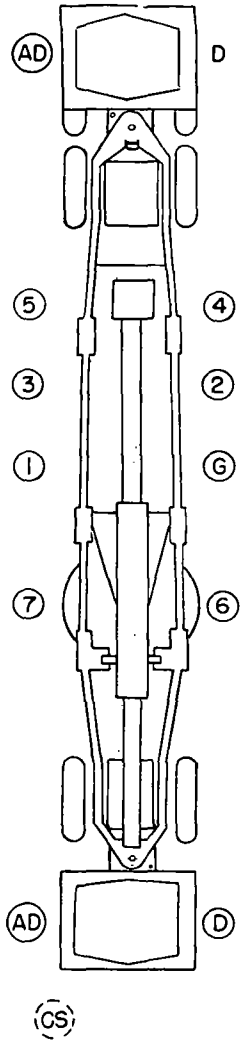


Figure 6. Posts of section, dismounted.

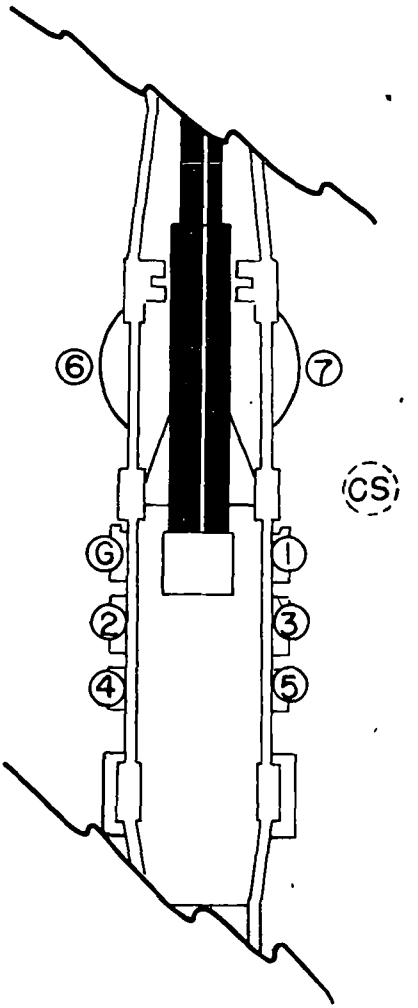


Figure 7. Posts of section, prepared for action.

b. Prepared for Action. The gun having been prepared for action, posts are taken as shown in figure 7. Gun section personnel not shown take posts as directed by the chief of section.

11. To Change Posts

To acquaint the members of the section with all duties and lend variety to drill, posts should be changed frequently. The section being *in formation* the commands are 1. CHANGE POSTS, 2. MARCH, or 1. SECTION CHANGE POSTS, 2. MARCH.

a. At 1. CHANGE POSTS, 2. MARCH all numbered cannoneers except No. 7 (or the highest numbered cannoneer) take two left steps, taking the position of the next higher numbered cannoneer. No. 7 moves at double time in rear of the section to the post of No. 1. All other members of the section stand fast.

b. At 1. SECTION CHANGE POSTS, 2. MARCH, the artillery mechanic and generator operator (or the leftmost man in each rank) move at double time in rear of the section to the posts of driver and gunner respectively. All other men in the formation take two left steps as in *a* above.

12. To Mount

The commands are 1. PREPARE TO MOUNT, 2. MOUNT, or MOUNT.

a. At the preparatory command, the section moves at double time to positions convenient for mounting into the vehicles in which they normally ride. At the command of execution, all personnel mount and seat themselves as shown

in figure 8. The chief of section is the last to mount. Together with the drivers, he makes a rapid inspection to insure that all personnel are aboard, the safety straps are in place, and that no equipment is being left behind.

b. If any members of the section are to remain dismounted, their designation is announced

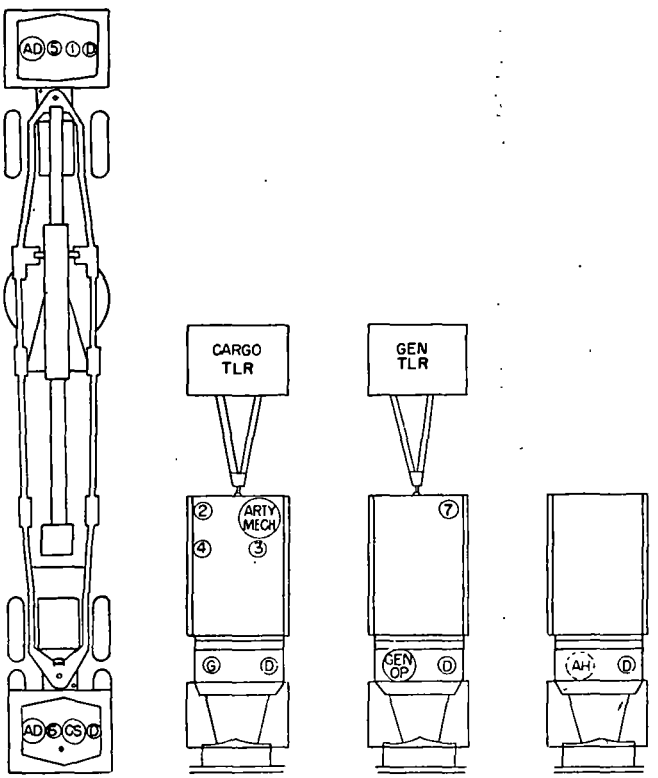


Figure 8. Section mounted.

with the caution, "Stand fast" given between the preparatory command and the command of execution. For example: 1. PREPARE TO MOUNT, "Drivers stand fast," 2. MOUNT.

c. If the command is MOUNT, the section executes without pausing all that is prescribed in *a* above.

13. To Dismount

The commands are 1. PREPARE TO DISMOUNT, 2. DISMOUNT, or DISMOUNT.

a. At the preparatory command, all members of the section ready themselves to dismount. At the command of execution, members of the section dismount in inverse order of mounting and quickly take posts as shown in figure 6.

b. If the command is DISMOUNT, the section executes without pausing all that has been prescribed for the command 1. PREPARE TO DISMOUNT, 2. DISMOUNT.

14. To Fall Out

a. At Drill. When it is desired to give the personnel a rest from drill or relieve them temporarily from a *formation* or *post,* the command FALL OUT is given. The command may be given at any time, and means that the section is to remain in vicinity of the drill area.

b. When Firing. When firing has been suspended temporarily, but it is desired to have the section remain in the vicinity of the gun, the command FALL OUT is given. Men stand clear of the gun to insure that settings and laying remain undisturbed. During these periods the

chief of section may direct his men to improve the position, to replenish ammunition, or to do other necessary work.

CHAPTER 4

PREPARING THE GUN FOR FIRING AND TRAVELING

Section I. PREPARATIONS FOR FIRING

15. General

The guns of a battery will ordinarily be put into position individually, under the direction of the platoon commanders and chiefs of section. Prior to occupation of the selected gun position, the ground must be leveled for the turntable and float. A stake should be driven into the ground at a point where the center of each turntable is to be placed. Another stake should be placed directly in rear of the direction of fire 50 to 100 yards from the turntable stake, so that the driver of the first transporter points the tube in the direction of fire as he drives into the position over the first stake headed toward the rear stake. Each gun is halted at its proper place by the chief of section. Hand signals for guiding the drivers are found in FM 21–60.

16. To Prepare for Action

a. The gun being in position, the command is PREPARE FOR ACTION. Duties of individuals are given in table I. Each man takes his post (fig. 7) upon completion of his duties.

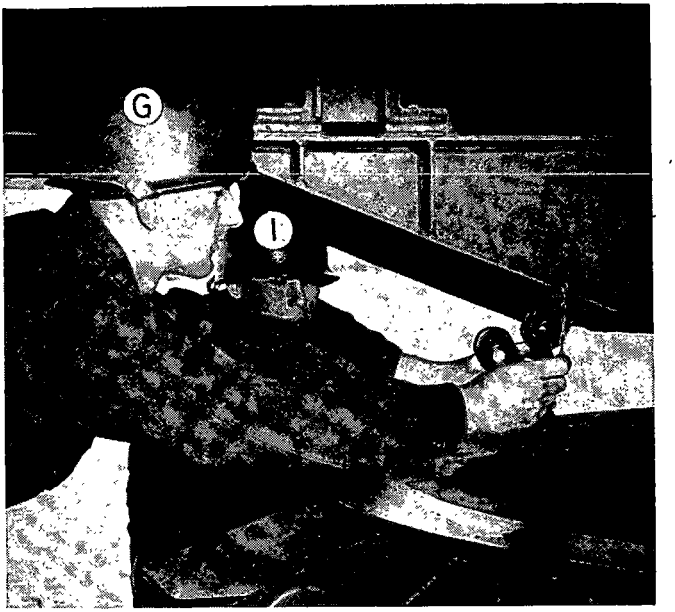


Figure 9. Gunner unlocking turntable lock.

b. Immediately after the gun is established in position, prepare for action is normally initiated without command.

c. If PREPARE FOR ACTION is not desired, the caution, "Do not prepare for action" must be given by the platoon commander or chief of section.

d. Prior to firing the first round, the bore is cleaned to remove preservative oils and any dust or foreign matter.

e. The gunner is responsible for coordination and safety on the left side of the gun and for relaying signals to and from the chief of section.

Figure 10. No. 6 disconnecting intercom cord.

Section II. PREPARATIONS FOR TRAVELING

17. March Order

To prepare to resume travel the command is MARCH ORDER. Duties of individuals are given in table II. Each man takes his post (fig. 6) upon completion of his duties.

18. To Resume Firing in Another Position

a. If firing is to be resumed shortly in another position from which the gun must be ready to fire quickly, the command MARCH ORDER is not given. When such a displacement is ordered, only those operations necessary for the movement

Table 11. Duties of Gun Section Personnel in March Order

Sequence	Chief of section	Gunner	Assistant Gunnar (No. 1)	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Ammo Cpl / Sr Ammo Handler / Ammo Handler	Gen Opr	"A" Unit Driver	Asst "A" Unit Driver	"B" Unit Driver	Asst "B" Unit Dr
1	Directs work of all section personnel throughout all sequences. Insures electrical connections are in off position. Directs that covers be placed on equipment as it is secured. Signals gunner when gun is in center of traverse.	Traverses gun to center of traverse, assisted by CS.	Mechanically depresses tube to 5°. Assisted by No. 7, manually depresses tube to traveling position. Assists Nos. 6 and 7 in securing cradle locks in travel position.	Assisted by No. 3, closes breech (fig. 33) and places loading trough in traveling position.	Assists No. 2 in closing breech. Assists No. 2 in placing loading trough in traveling position.	Removes left retraction atop pin. Secures left lifting fork guide in limbered traveling position.	Removes right retraction atop pin. Secures right lifting fork guide in limbered traveling position.	Locks left cradle lock. Insures that rear jack is a minimum of 4 inches above turntable track	Assists No. 1 in depressing tube to traveling position. Locks right cradle lock. Places primary recoil marker in "out" position.	Under supervision of ammunition corporal, prepare ammunition for traveling.	Turns off generator. Unplugs generator transmission cable from gun. Rolls up generator transmission cable and assists in coupling generator trailer to truck.	Drives "A" unit to lifting position.	Guides driver into lifting position.		
						Secures loading davit.									
2		Removes panoramic telescope from mount and secures it.		Attach turnbuckle to eye on front of breech ring and take up slack.				Retrieves aiming posts, disassembles, and places in case.					Assisted by No. 4, unreels winch cable.		
				Pass winch cable forward to retracting eyebolt where No. 2 secures cable to eyebolt.											
3	Verifies carriage is in proper position to retract tube. If gun is inclined toward rear, directs employment of a safety measure.			Unlocks left piston recoil rod lock.	Unlocks right piston recoil rod lock.			Secures left front lifting fork guide in limbered traveling position.	Secures right front lifting fork guide in limbered traveling position.						
				Remove turnbuckle and secure in traveling position.											
4	Insures that all personnel are clear of path of tube. Signals assistant "A" unit driver to retract tube.				When tube is in traveling position, place right and left retraction atop pins in retraction atop.								On signal from CS, winches tube into traveling position.	Drives transporter to gun and places lifting fork on carriage.	Guides driver into lifting position.
5						Detaches winch cable and assists assistant "A" unit driver in securing it.						Drives transporter to lifting position.	Assisted by No. 4, secures winch cable on drum.		Replaces muzzle cover.
		Secure platforms in traveling positions.													
6						Hooks left rear shackle under lifting hook.	Hooks right rear shackle under lifting book.	Hooks left front shackle under lifting book.	Hooks right front shackle under lifting hook.			Sets brakes.			
7	Signals "B" unit driver to raise gun off ground. Signals assistant "A" unit driver to lift gun approximately 6 inches off ground. When Nos. 4 and 5 have secured rear float in traveling position, signals assistant "A" unit driver to raise gun to traveling position.	Assists No. 6 in emplacing left front wedge.	Assists No. 7 in emplacing right front wedge.	Assists No. 4 in emplacing left rear wedge.	Assists No. 5 in emplacing right rear wedge.	Secures left rear float at traveling lock. Emplaces and secures left rear wedge.	Secures right rear float at traveling lock. Emplaces and secures right rear wedge.	Emplaces and secures left front wedge.	Emplaces and secures right front wedge.				Raise gun and carriage as indicated by signals of chief of section.		
8		Assists No. 6 in connecting left front emergency hose and intercom cord. Assisted by No. 1, rotates and locks turntable.	Assists No. 7 in connecting right front emergency and accelerator hoses. Assists gunner in rotating and locking turntable.	Assists No. 4 in connecting left rear emergency hose and intercom cord.	Assists No. 5 in connecting right rear emergency and accelerator hoses.	Removes and connects left rear emergency hose and intercom cord. Turns on left rear emergency valve.	Removes and connects right rear emergency and accelerator hoses. Turns on right rear emergency and accelerator valves.	Removes and connects left front emergency hose and intercom cord. Turns on emergency valves. Turns left cross-leveling jack until roller rests on rail.	Removes and connects right front emergency and accelerator hoses. Turns on emergency valves. Turns right cross-leveling jack until roller rests on rail.						
9	Verifies that section is prepared to travel. Reports to platoon commander, "Sir, No. (so-and-so) in order."	Replace overall cover and stow equipment.													

Figure 11. No. 6 disconnecting emergency hose.

of the gun and the security of equipment are performed.

b. If the command MARCH ORDER is given while the gun is prepared for travel as described in *a* above, the remaining operations pertaining to march order are completed.

Figure 12. No. 4 removing left wedge fastening key.

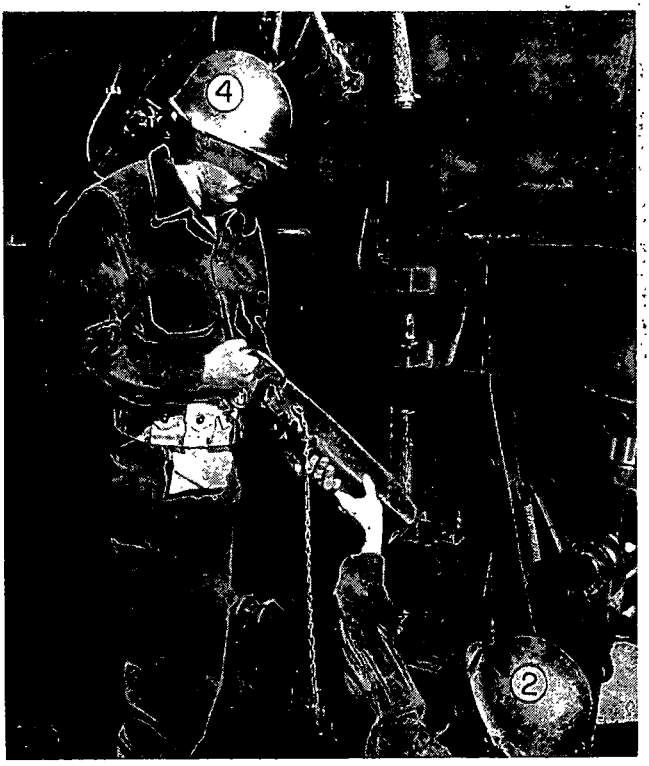


Figure 13. No. 4 removing left rear wedge.

Figure 14. No. 5 unlocking right traveling lock on rear float.

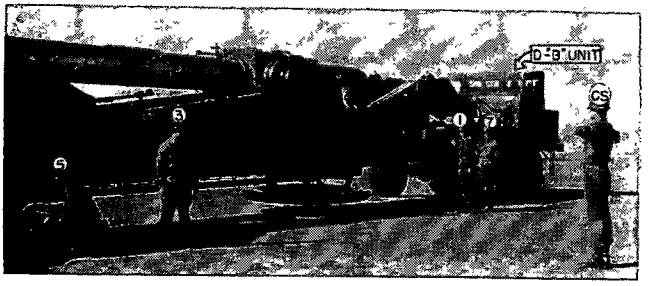


Figure 15. Chief of section signaling "B" unit driver and assistant "A" unit driver to lower gun.

Figure 16. No. 7 unhooking right front shackle.

Figure 17. No. 7 attaching right front shackle to transporter.

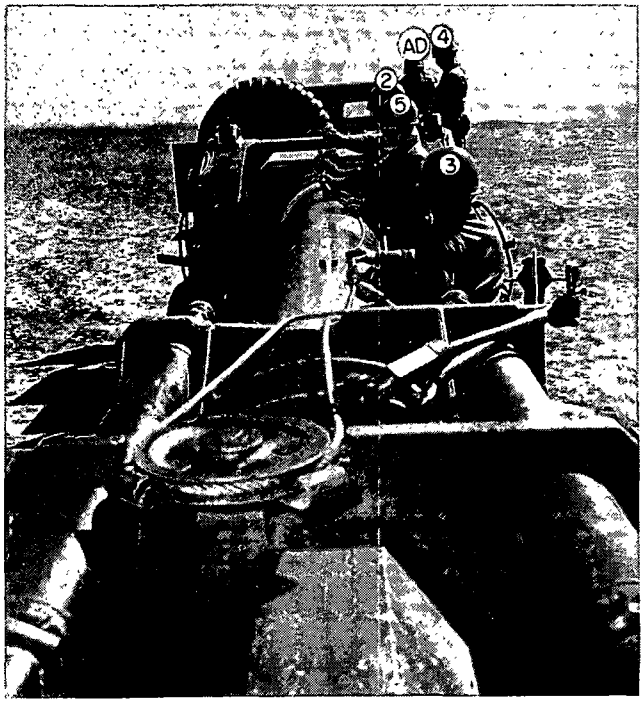


Figure 18. Threading winch cable.

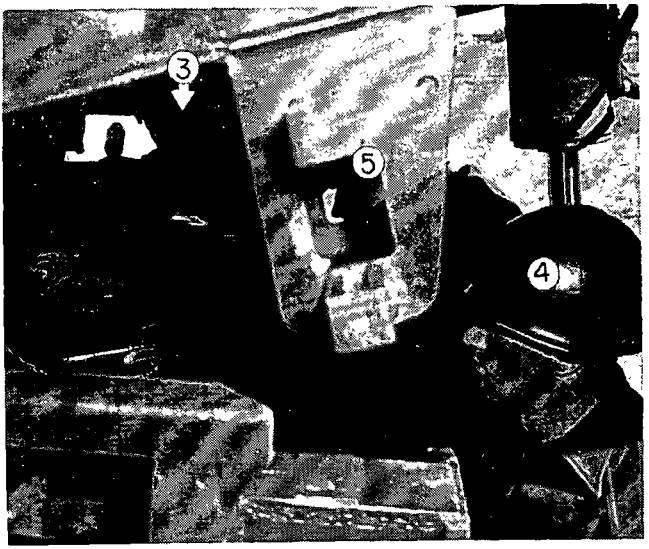


Figure 19. Removing retraction stop pins.

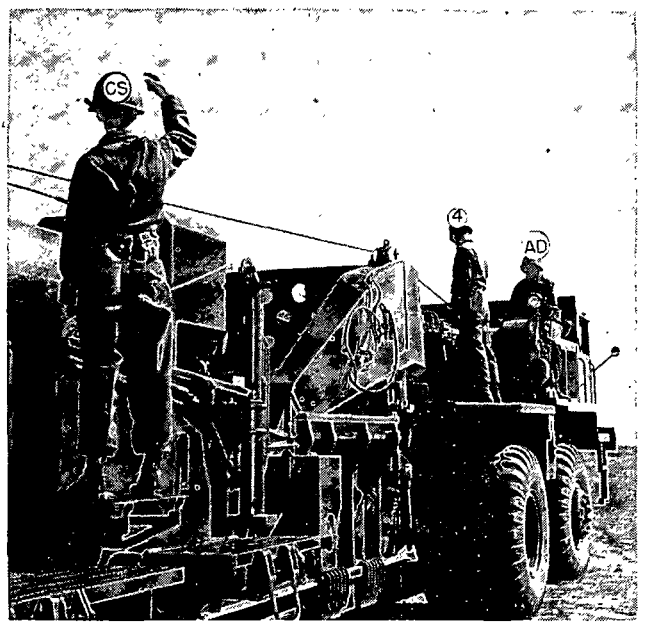


Figure 20. Winching tube forward into battery.

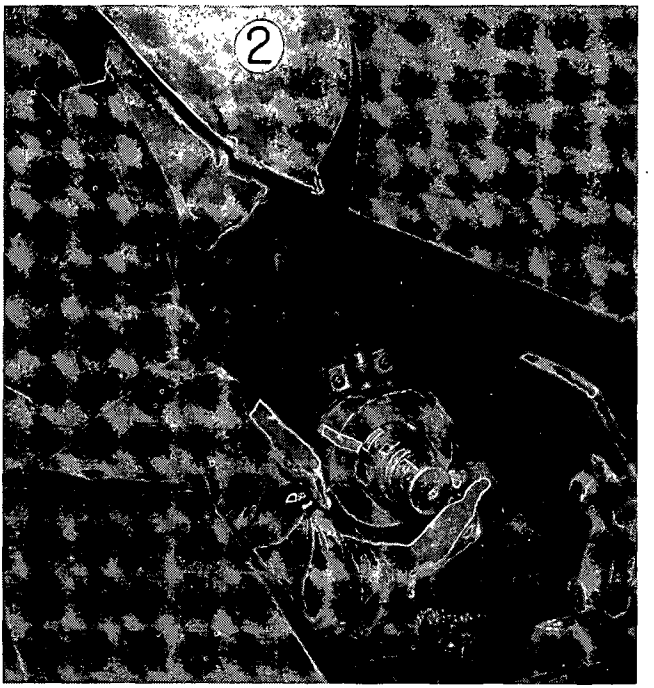


Figure 21. No. 2 locking left piston recoil rod lock.

Figure 22. Nos. 6 and 7 unlocking cradle traveling locks.

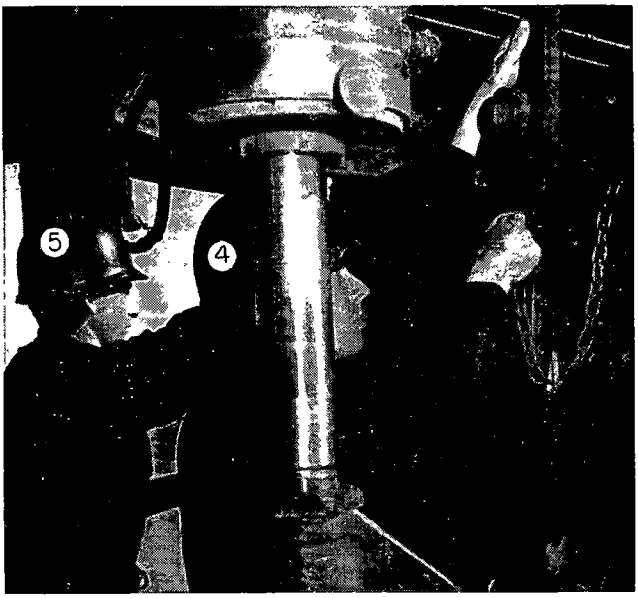


Figure 23. Securing front transporter lifting fork traveling locks.

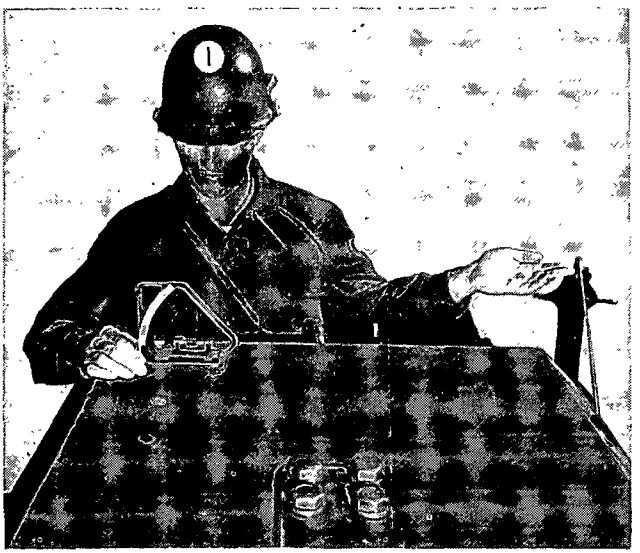


Figure 24. Cross-leveling the gun.

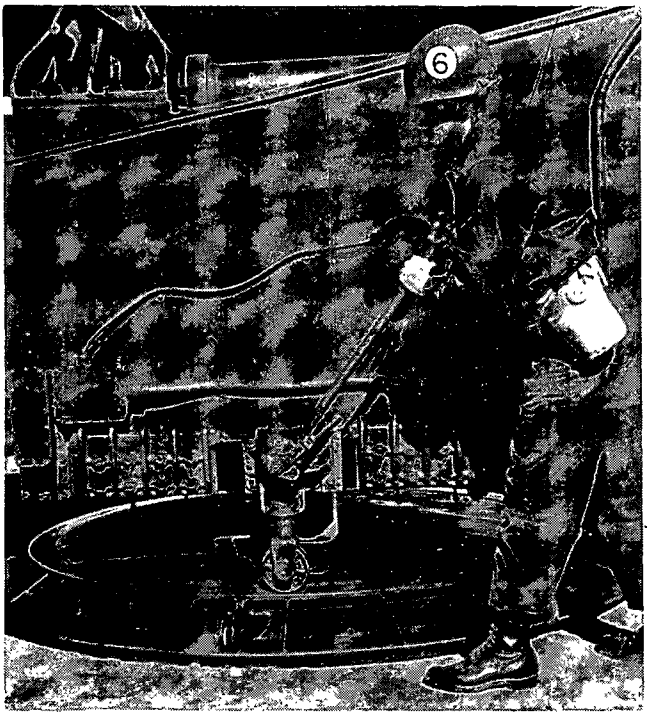


Figure 25. No. 6 operating left cross-leveling jack.

Figure 26. Generator operator plugging in generator transmission cable.

Figure 27. Nos. 1 and 7 elevating the tube manually.

Figure 28. Nos. 2 and 3 opening the breech.

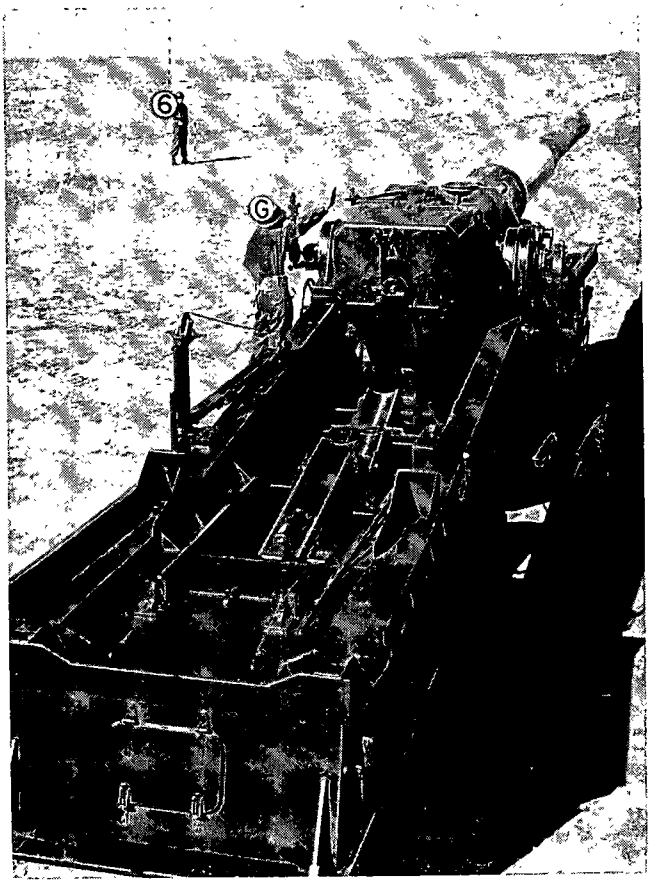


Figure 29. Alining the aiming posts.

Table III. Duties in Firing

Sequence	Chief of section	Gunner	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Ammo Cpl, Sr. Ammo Handler and Ammo Handlers
1	Directs work of section personnel throughout all sequences.		Brings tube to or near loading elevation mechanically. If manual refinement is necessary, is assisted by No. 7.	Assisted by No. 3, opens breech. Wipes chamber dry for first round. Swabs between rounds. Inspects bore; if clear, announces "Bore clear."	Assists No. 2 in opening breech, cleaning, and swabbing chamber.	Places davit in position for receiving projectile.		Assists No. 4 in operating the loading davit.	Assists No. 1 in manual setting of loading elevation, if required.	Under supervision of ammunition corporal, process rounds, propelling charges and fuzes, and bring to gun as required.
2				Assisted by No. 3, unfolds loading trough to loading position.	Assists No. 2 in unfolding loading trough.					
3				Guides projectile to proper position on loading trough. Inspects round for proper condition and cleanliness.	Assists No. 2 in placing round on loading trough.	Assisted by No. 6, operates loading davit (fig. 30).	Assists No. 2 in placing round on loading trough.	Assists No. 4 in operating dsvit (fig. 30).		Assist in securing shot tongs to round (fig. 30).
				Assisted by No. 3, fuzes round.	Assists No. 2 in fuzing round.			Hands fuze to No. 2.		Pass fuze to No. 6.
4						Controls power switch as ordered.	Calls "Power on." Rams projectile with power rammer (fig. 31). Calls "Power off."	Secures dsvit lifting hook in hook eye.		
				If hand ramming other than with the manual rammer crank is necessary, cannoneers dismount, take alternate positions on rammer staff, and hand ram.						
5				Receives powder charges from No. 4, inspects and places them on trough, and pushes charges into chamber with base 3 inches inside the chamher.	Assists No. 2 in placing powder charges on loading trough.	Receives powder charges from ammunition handler and passes to No. 2 (fig. 32).	If power rammer is used to load charges, rams slowly to prevent damage to bags.			Pass powder charges to No. 4.
6				Assisted by No. 3, retracts loading trough, checks to insure that safety catch is engaged.	Assists No. 2 in retracting loading trough.					
				Close breech (fig. 33).						
7	If gunner's quadrant is used (fig. 36), assisted by No. 1, sets elevation. Announces "Set."	Sets deflection Reports "Ready."	Calls "Power on." Sets elevation (fig. 34) mecbanically (fig. 35). Calls "Power off." Assisted by No. 7, refines manually if necessary. Announces "Set." If gunner's quadrant is used, assists chief of section in setting elevation.	Announces "Loaded."					Assists No. 1 in setting elevation manually.	
8	Clears gun of all personnel except No. 3.				Inserts primer, connects lanyard spring clip to magneto (fig. 37), and moves 50 feet to rigbt of gun.		Hands lanyard to No. 3.			
9	Raises arm to indicate gun is ready to fire. On command of gun platoon commander, drops arm.				When chief of section drops arm, fires gun. Removes lanyard and spent primer.					
10		Checks aiming post displacement.	Depresses tube to load position.	Assisted by No. 3, opens breech, inspects bore; swabs and cleans obturator spindle vent with cleaning bit. Announces "Bore clear."	Assists No. 2 in opening breech snd swabbing bore.				Passes up swab and cleaning bit to Nos. 2 and 3.	

CHAPTER 5
DUTIES IN FIRING

19. Loading and Firing

Section I. GENERAL

The sequence of duties performed in loading and firing is shown in table III. The artillery mechanic (not shown in the table) will measure the length of recoil of both the primary and secondary recoil mechanisms. He will also check the oil indexes of the recoil mechanisms and report any deficiencies to the gun platoon commander. The gun tube must be level when the artillery mechanic checks the recoil indexes.

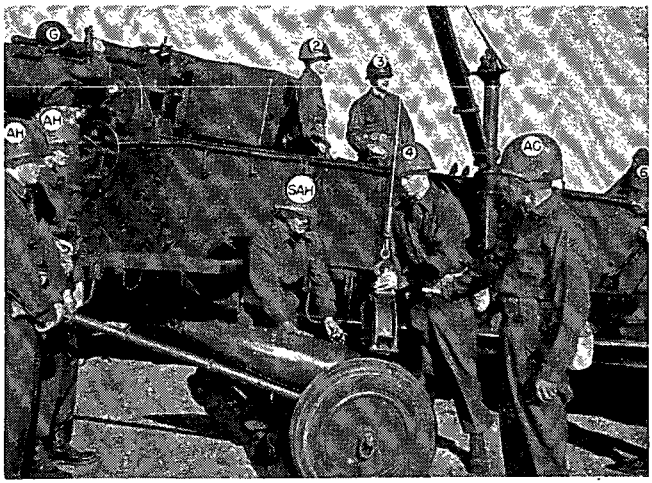


Figure 30. Operating the loading davit.

Figure 31. No. 5 operating the power rammer.

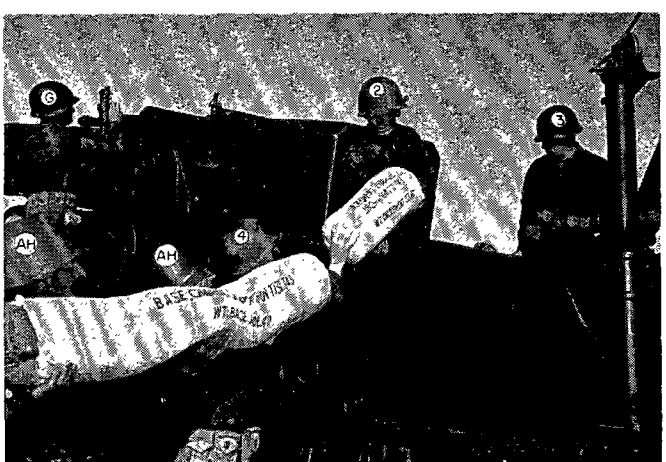


Figure 32. Passing the powder charges to No. 2.

Figure 33. Nos. 2 and 3 closing the breech.

Figure 34. Setting elevation.

Figure 35. Elevating the tube.

Figure 36. Refining the announced quadrant.

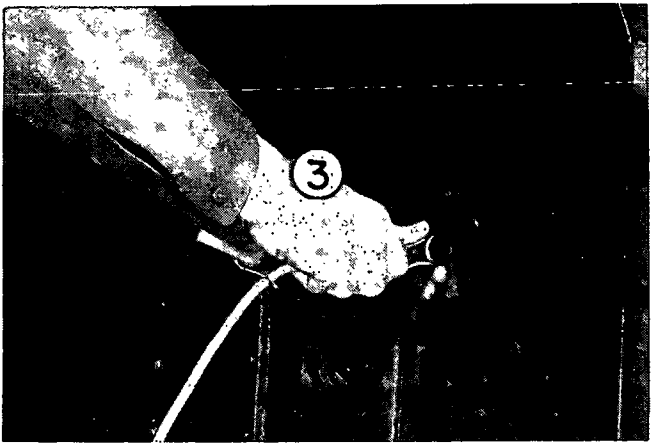


Figure 37. No. 3 attaching the lanyard to the firing magneto.

20. Duties of Individuals

The general instructions given in paragraphs 7 and 8 on the conduct of section drill apply equally to section drill in duties in firing. For duties of the battery executive, see FM 6–140. In general, the duties of individuals in the section in firing are as follows:

a. The chief of section supervises and commands his section and is responsible that all duties are performed properly, all commands executed, and all safety precautions observed.

b. The gunner sets the announced deflection, levels the telescope mount, lays the gun for direction, and refers the gun.

c. No. 1 operates the elevation quadrant, elevating speed control handle, and elevating brake pedal and, assisted by No. 7, operates the elevating handwheel.

d. No. 2, assisted by No. 3, opens and closes the breech, unfolds and retracts the loading trough, guides the projectile to proper position on loading trough, inserts propelling charges, and cleans the breech after every round.

e. No. 3, in addition to assisting No. 2 in the duties described in *d* above, primes and fires the gun.

f. No. 4 operates the loading davit and passes propelling charges up to No. 2.

g. No. 5 assists Nos. 2 and 3 in placing the round on the loading trough and rams projectiles.

h. No. 6 assists No. 4 in operating the loading davit.

i. No. 7 assists No. 1 in operating the elevating handwheel and passes up the swab and bit to Nos. 2 and 3.

Section II. DUTIES OF CHIEF OF SECTION

21. List of Duties

(Detailed description of duties, pars 22–36.)

a. Measures the site to the mask.

b. Indicates to the gunner the aiming point.

c. Follows fire commands.

d. Indicates when the gun is ready to fire.

e. Gives command to fire.

f. Reports mistakes and other unusual incidents of fire to gun platoon commander.

g. Conducts prearranged fires.

h. Records basic data.

i. Observes and checks functioning of materiel.

j. Measures the elevation.

k. Assigns duties when firing with reduced personnel.

l. Lays for elevation when gunner's quadrant is used.

m. Verifies adjustment of sighting and fire control equipment.

n. Directs swabbing of the bore.

o. Directs movement of the carriage.

22. Measures The Site to The Mask

a. The command is MEASURE THE SITE TO THE MASK. The chief of section, sighting along the lowest element of the bore, directs the gunner and Nos. 1 and 7 to operate the traversing and elevating mechanisms until his line of

sight just clears the crest at its highest point in the probable field of fire. He then has No. 1 measure, by means of the elevation quadrant, the elevation at which the gun is laid. The chief of section reports to the gun platoon commander, "No. (so-and-so), site (so much)."

b. When the gun platoon commander announces the minimum quadrant elevation for each charge, the chief of section records it in a notebook and directs No. 1 to chalk the minimum elevation for each charge to be used on a convenient part of the carriage or on the section data board.

23. Indicates to Gunner the Aiming Point

Whenever an aiming point has been designated by the gun platoon commander (FM 6–140), the chief of section will make sure that he has properly identified the point designated. He will then indicate it to the gunner. If there is any possibility of misunderstanding, the chief of section will turn the panoramic telescope until the horizontal and vertical hairs are on the point designated.

24. Follows Fire Commands

The chief of section will follow the fire commands. He will repeat the commands as required.

25. Indicates When Gun is Ready To Fire

When the gun platoon commander can see arm signals of the chief of section, the chief of sec-

tion will extend his right arm vertically upward as a signal that the gun is ready to fire. He gives the signal as soon as the gunner calls "Ready." When arm signals cannot be observed, the chief of section reports orally to the gun platoon commander, "No. (so-and-so) ready."

26. Gives Command To Fire

When No. 3 can see arm signals made by the chief of section, the chief of section will give the command to fire by dropping his right arm sharply to his side. When his arm signals cannot be seen, he commands orally NO. (SO-AND-SO) FIRE. *The chief of section will not give the signal or command to fire until all the cannoneers are in safe positions.*

27. Reports Mistakes and Other Unusual Incidents of Fire to Gun Platoon Commander

If for any reason the gun cannot be fired, the chief of section will report promptly that fact and the reason to the gun platoon commander; for example, "No. (so-and-so) out, misfire." Whenever it is discovered that the gun has been fired with a mistake in laying, the chief of section will report that fact at once; for example, "No. (so-and-so) fired 40 mils right." Whenever the gunner reports that the aiming posts are out of alinement with the sight, at the first lull in firing the chief of section will report that fact and request permission to realine them. Likewise, other unusual incidents that affect the service of the weapon are reported promptly.

28. Conducts Prearranged Fires

Whenever the execution of prearranged fires is ordered, the chief of section will conduct the fire of his section in conformity with prescribed data.

29. Records Basic Data

The chief of section will record data of a semipermanent nature in a notebook. These include such data as minimum elevations; aiming points used and their deflections; prearranged fires when section data sheets are not furnished; safety limits in elevation and deflection; number of rounds fired, with the date and hour; and calibration corrections when appropriate.

30. Observes and Checks Functioning of Materiel

The chief of section closely observes the functioning of all parts of the materiel during firing. Before the gun is fired, he makes certain that the recoil and counterrecoil systems contain the proper amount of oil; thereafter, he carefully observes the functioning of these systems. He reports to the gun platoon commander any evidence of malfunctioning (TM 9–338–1).

31. Measures the Elevation

At the command MEASURE THE ELEVATION, the gun having been laid, the chief of section directs No. 1 to center the cross-level bubble on the quadrant mount. The chief of section then sets the micrometer of the gunner's quadrant at zero and places it on the seats of the quadrant mount. He then performs the following:

a. Moves the index arm of the gunner's quadrant until the bubble passes to the end of the vial away from the index arm hinge.

b. Lowers the index arm slowly until the bubble just passes to the end of the vial toward the hinge.

c. Turns the micrometer until the bubble is accurately centered.

d. Removes the quadrant and reports the elevation thus set to the nearest 0.1 mil as "No. (so-and-so), elevation (so much)."

32. Assigns Duties When Firing With Reduced Personnel

Whenever the personnel of the section serving the gun is temporarily reduced in number below that indicated in this manual, the chief of section will make such redistribution of duties as will facilitate firing. Understrength units, loss of cadremen, casualties, and various details will necessitate gun section operation with a reduced number of personnel to the extent that it is almost normal for cannoneers to double up on duties. When round-the-clock firing is to be rendered, cannoneers must split up and work in shifts so that provision can be made for relief. Duties that lend themselves to convenient combinations are—

Chief of section, gunner, and No. 2
Gunner and No. 2.
No. 1 and No. 3.
No. 4 and No. 6.
No. 5 and No. 7.

33. Lays for Elevation When Gunner's Quadrant is Used

a. The command is QUADRANT (SO MUCH). In laying for elevation, the gunner's quadrant is always used on the gunner's quadrant seat on the elevation quadrant M1. The leveling plates on the tube are used only when some part of the elevation quadrant M1 mechanism is damaged or impractical to use.

b. An announced quadrant of 361.8, for example, is set on the gunner's quadrant as follows: The upper edge of the index plate is set opposite the 360 mark of the graduated arc on the quadrant frame, and the micrometer on the index arm is trurned to read 1.8. Care must be taken to use the same side of the quadrant in setting both the index plate and the micrometer knob.

c. The announced quadrant having been set on the gunner's quadrant, the gun loaded, and the breechblock closed, the gunner's quadrant is set on the gunner's quadrant seat of the elevation quadrant M1. The words *line of fire* must be at the bottom of the quadrant, and the arrow must be pointing toward the muzzle. The chief of section must be sure to use the arrow which appears on the same side of the quadrant as the scale that he is using. He stands squarely opposite the side of the quadrant and holds it firmly on the quadrant seat, parallel to the axis of the bore. *It is important that he take the same position, hold the quadrant in the same manner for each subsequent setting, and view the quadrant bubble from the same angle.*

d. The chief of section then directs Nos. 1 and 7 to elevate or depress the gun until the bubble is centered. The chief of section cautions Nos. 1 and 7 when the bubble is approaching the center, in order that the final centering may be performed accurately.

e. Normally, if special and calibration corrections are used, they will be added algebraically at the battery fire direction center. The quadrant then would be announced as "No. (so-and-so), quadrant (so much)."

34. Verifies Adjustment of Sighting and Fire Control Equipment

See TM 9–338–1 and chapter 7 for detailed instructions on testing and adjusting sighting and fire control equipment.

35. Directs Swabbing of Bore

During lulls in firing and if possible after every 10 rounds, the chief of section will direct the cannoneers to swab the bore. For this operation, it is necessary to assemble the bore brush with all sections of the rammer staff. Water should be used freely to assist in cooling the gun.

36. Controls Movement of Carriage

When it is necessary to shift the direction of the carriage, the chief of section orders the rear float raised. He then controls the movement of the carriage by hand signals or oral instruction transmitted between himself and the gunner. For further details, see paragraph 90.

Section III. DUTIES OF GUNNER

37. List of Duties

(Detailed description of duties, pars. 38–47.)

a. Sets or changes a deflection.

b. Lays the gun for direction.

c. Centers the cross-level bubble on the panoramic telescope mount.

d. Calls "Ready."

e. Refers the gun.

f. Alines the aiming posts.

g. Sets a common deflection on a common aiming point after the gun has been laid.

h. Applies special corrections for deflection.

i. Makes correction for aiming post displacement.

38. Sets or Changes a Deflection

The command is DEFLECTION (SO MUCH). If, for example, the command is DEFLECTION 2483, the gunner disengages the throwout lever with his left thumb and turns the rotating head of the sight (fig. 38) to 24(2400). He releases the throwout lever and, with his right hand, turns off the remaining 83 mils on the micrometer scale (fig. 39). He then traverses the gun until the vertical hair of the reticle is on the aiming post, being careful that the last motion is such as to cause the vertical hair of the telescope to approach the aiming point from the left to take up any lost motion in the mechanism.

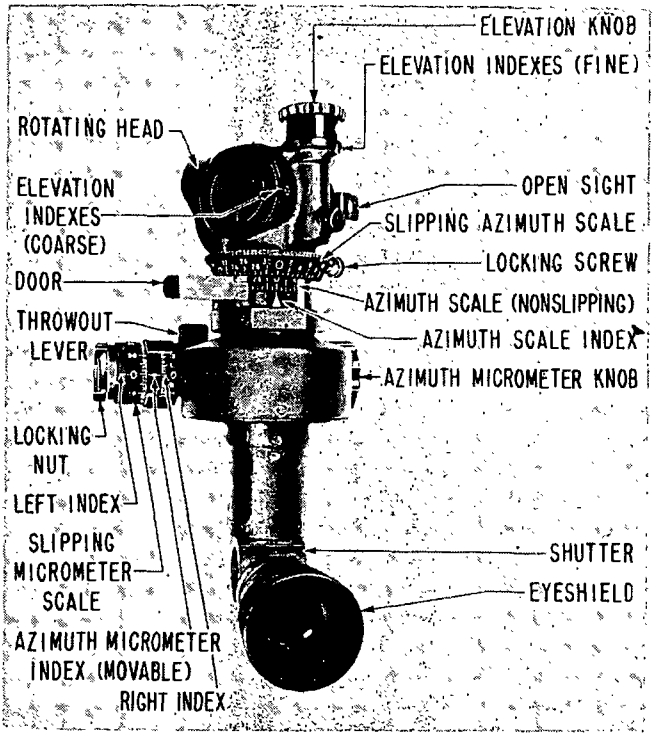


Figure 38. Panoramic telescope M12A7 series.

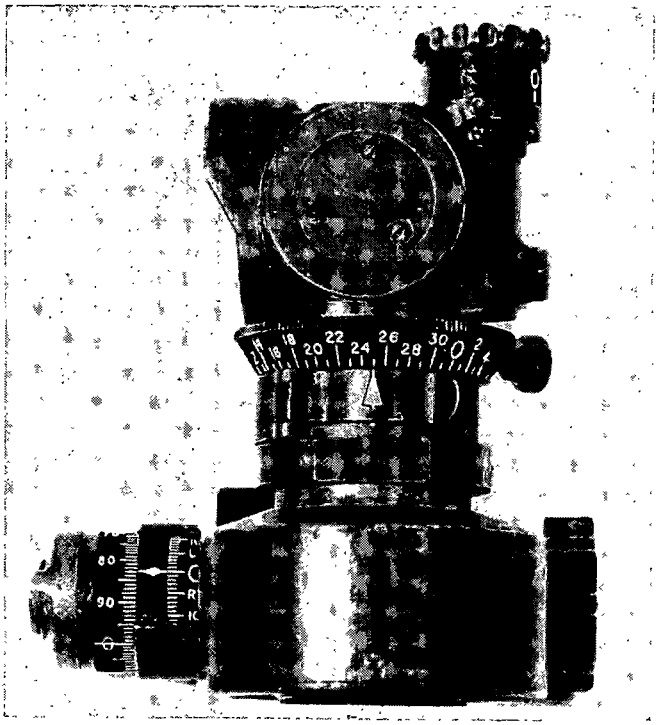


Figure 39. Deflection 2483.

39. Zero the Sight

a. The gunner alines the movable azimuth micrometer index (gunner's aid) of the sight with the right (fixed) index.

b. Loosens the slipping micrometer scale locking nut by turning it counterclockwise, firmly holding the azimuth micrometer knob with his right hand (fig. 40).

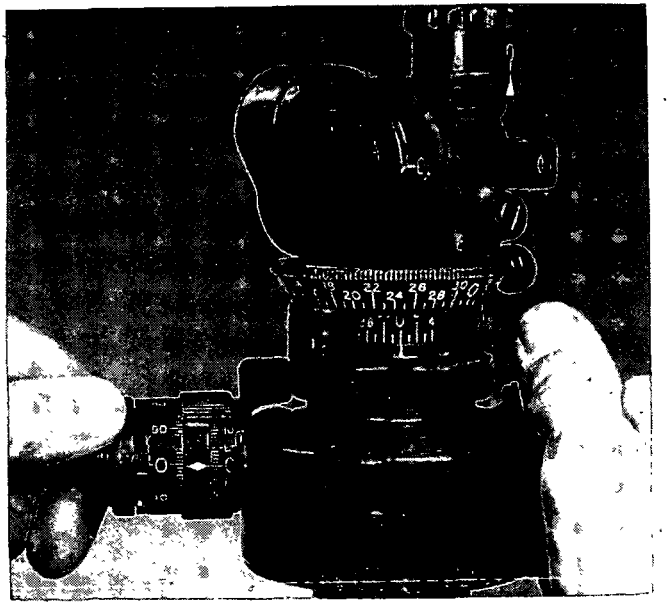


Figure 40. Loosening slipping micrometer scale locking nut.

c. Slips the slipping micrometer until its zero is in coincidence with the left index (fig. 41), tightens the locking nut, and verifies the alinement of zero of the scale with the left index.

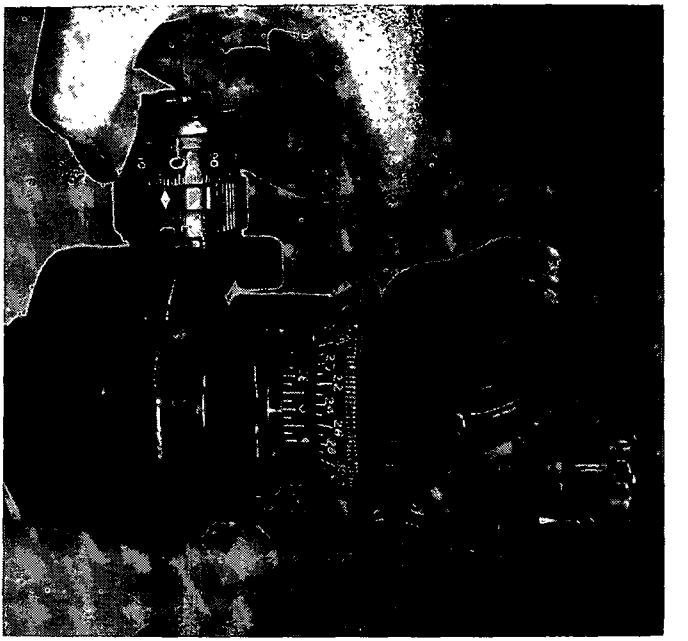


Figure 41. Alining the zero of the slipping micrometer scale with the left index.

d. Turns the azimuth micrometer knob so that the left index and zero of the slipping micrometer are alined with the zero of the gunner's aid and right index.

e. Opens the door and with the azimuth micrometer knob or rotating head sets the nonslipping azimuth scale at zero (fig. 42) and closes the door.

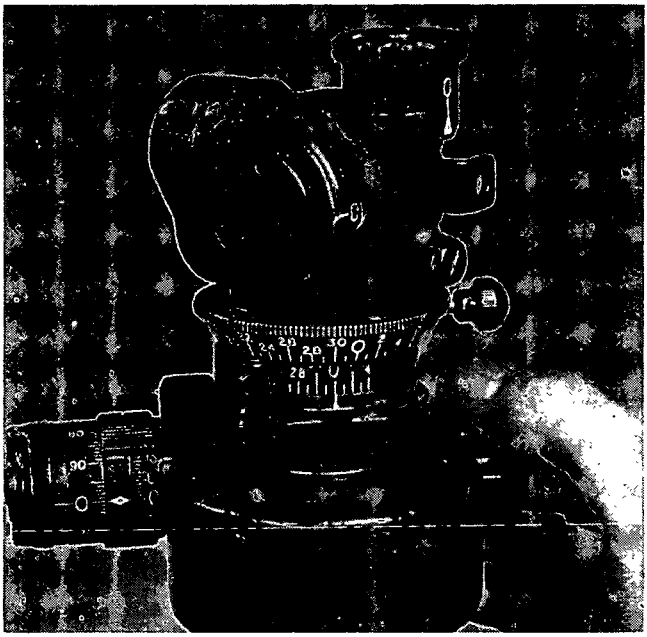


Figure 42. Turning the nonslipping azimuth scale to zero.

f. Loosens the slipping azimuth scale locking screw; moves the slipping azimuth scale until its zero coincides with the index on the outside of the door (fig. 43).

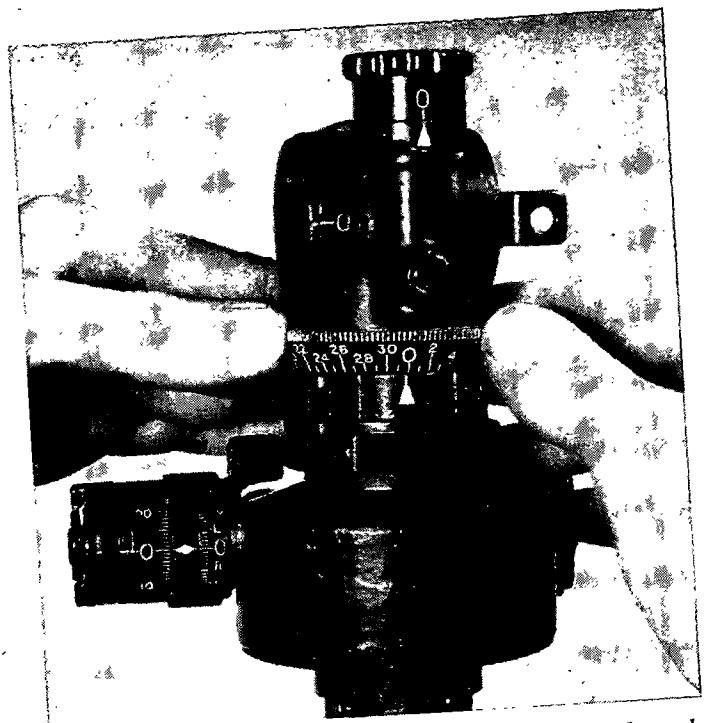


Figure 43. Slipping zero of the slipping azimuth scale to index on door.

g. Tightens the locking screw and verifies the reading. With the sight thus zeroed, the gunner in indirect fire will habitually set and read deflections on the slipping azimuth scale at the index on the door, setting and reading the last two digits of the deflection on the azimuth micrometer.

40. Lays Gun for Direction

The gun platoon commander commands AIMING POINT THIS INSTRUMENT, NO. (SO-AND-SO), DEFLECTION (SO MUCH). The gunner, having zeroed the sight (par. 39), sets the deflection for his gun on the panoramic telescope by disengaging the throwout lever and turning the rotating head to the announced hundred mil graduation. He releases the throwout lever and turns off the last two digits of the deflection on the azimuth micrometer scale, using the azimuth micrometer knob. He then traverses the gun until his line of sight through the telescope is on the gun platoon commander's aiming circle. He checks to insure that his bubbles are level and announces, "No. (so-and-so) ready for recheck." As additional deflections are announced by the gun platoon commander, he sets them on the sight and traverses the gun so that his vertical hair of the reticle is on the aiming circle. When the gun platoon commander announces, "No. (so-and-so) is laid," the tube is oriented and should not be traversed except on order of the gun platoon commander.

41. Centers Cross-Level Bubble on Panoramic Telescope Mount

The gunner centers the cross-level bubble on the telescope mount as part of all operations that involve the use of the panoramic telescope. This bubble is centered prior to using the telescope, and the level of the mount is verified before firing.

42. Calls "Ready"

The gun having been laid for direction and No. 1 having called "Set," the gunner verifies the laying, moves clear of the telescope, and calls "Ready" to indicate that the gun is ready to be fired.

43. Refers Gun

The command from the executive is AIMING POINT THIS INSTRUMENT (OR OTHER POINT), REFER. Without disturbing the laying of the gun, the gunner turns only the sight until, with the bubbles level, the vertical hair is on the point designated. He then reports the deflection to the gun platoon commander, "No. (so-and-so), deflection (so much)."

44. Alines Aiming Posts

The gun having been laid, as in paragraph 40, the gun platoon commander may command AIMING POINT, AIMING POSTS, DEFLECTION 2200, REFER. At this command, the gunner sets the panoramic telescope at deflection 2200 (fig. 44) and, with hand signals, directs No. 6 in the alinement of the posts (fig. 29) with the vertical hair of the sight. If because of the nature of the terrain the posts cannot be set out at deflection 2200, the gunner turns the azimuth micrometer knob until the slipping azimuth scale is on another even hundred mil graduation. He alines the posts at this new deflection. The chief of section reports the altered deflection to the gun platoon commander, "No. (so-and-so) aiming

posts at (so many hundred), deflection 2200 in lake (or other reason)." The gun platoon commander will then command NO. (SO-AND-SO), DEFLECTION 2200, REFER. At this command, the gunner loosens the slipping azimuth scale locking screw and moves the slipping azimuth scale to deflection 2200. He then tightens the locking screw and verifies the adjustment.

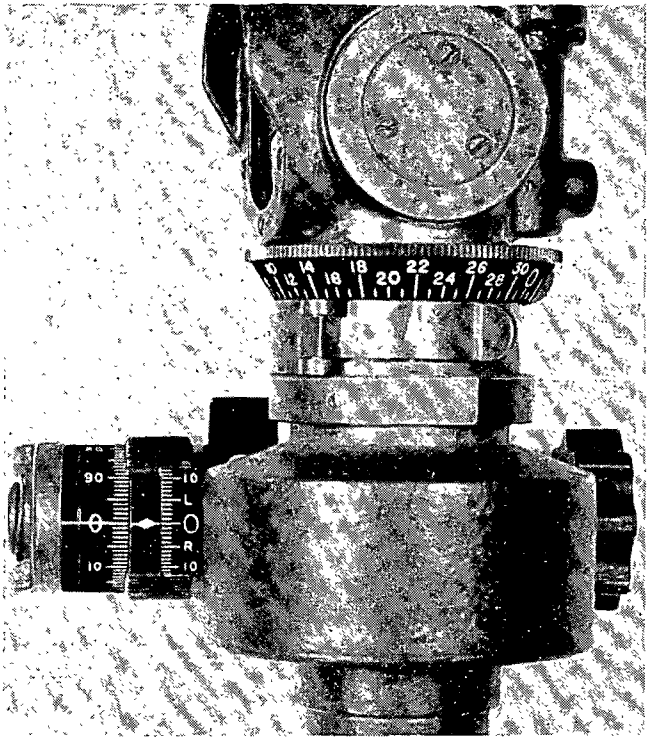


Figure 44. Common deflection 2200.

45. Sets a Common Deflection on a Common Aiming Point after Gun Has Been Laid

The battery having been laid, the executive may command AIMING POINT, CHURCH STEEPLE, REFER. At this command, without moving the tubes, the gunners of both guns turn their sights to the aiming point designated and report the deflections to their gun platoon commanders. The executive then commands COMMON DEFLECTION 2200. At this command, each gunner loosens the locking screw of the slipping azimuth scale and moves the scale until 2200 is in coincidence with the index on the door. The gunners then unlock the slipping azimuth micrometer scale locking nut and move the slipping azimuth micrometer scale to zero; then tighten the locking nut and verify that zero is in coincidence with the index and that the line of sight is still on the aiming point.

46. Applies Special Corrections for Deflection

The gunner applies special corrections to the announced deflection for his gun by moving the movable azimuth micrometer index the proper amount and direction. For example, the executive announces SPECIAL CORRECTIONS, DEFLECTION 2265, NO. 1 LEFT 10. The gunner on No. 1 gun first sets off the announced deflection, then moves the azimuth micrometer index (gunner's aid) upward 10 mils. He then resets the announced deflection at the index in its new position. Subsequent deflections, which are set on the azimuth micrometer scale, will be in-

creased 10 mils automatically. The *special correction* is left on the gunner's aid until completion of the mission or until a new special correction is announced. The new special correction is set off as commanded and is *not* applied algebraically by the gunner.

47. Makes Correction for Aiming Post Displacement

For details of correcting for aiming post displacement, see paragraph 89.

Section IV. DUTIES OF CANNONEERS

48. No. 1, List of Duties

(Detailed description of duties, pars. 49–53.)

a. Cross-levels elevation quadrant.
b. Lays the gun for elevation.
c. Operates the elevating brake pedal.
d. Disengages and secures latch pin.
e. Calls "Set."
f. Brings tube to loading elevation.

49. Cross-Levels Elevation Quadrant

No. 1 turns the cross-leveling knob until the cross-level bubble is centered. After the gun is laid for elevation and before making the final check of the longitudinal bubble, he will verify the cross-leveling.

50. Lays Gun for Elevation

No. 1 places the elevating selector handle in the power elevating position. He then depresses

the elevating brake pedal, grasps the elevating speed control handle, depresses the plunger knob, and pushes the handle toward the appropriate instruction plate. When the tube is brought to the general elevation desired, the handle is returned to the neutral position and the brake released. Th power is turned off, and the elevating selector handle is pulled to the manual position. The setting is then refined manually with the elevating handwheel. The last motion of the tube is in the direction in which it is more difficult to turn the handwheel. Through practice, the use of the elevating handwheel can be cut to a minimum by proper control of the elevating speed control handle.

51. Operates Elevating Brake Pedal

The purpose of the elevating brake pedal is to hold the gun at any desired elevation. In no case will it be used to stop the gun at a given elevation unless the elevating speed control handle is in the neutral position. Otherwise, damage will result to the mechanical braking system.

52. Disengages and Secures Latch Pin

The elevating speed control handle and the rammer speed control handle are interconnected. Power to the control handles is determined by the position of the loading trough. When the loading trough is unfolded, power is to the rammer. Therefore, during ramming, No. 1 must lock the latch pin of the elevating control handle out of its notch to permit operation of the

rammer speed control handle. Immediately after ramming, No. 1 releases the latch pin.

53. Calls "Set"

When all of the above operations have been completed, No. 1 calls "Set" sharply to notify the gunner that the operations necessary for laying the gun in elevation are finished.

54. No. 2, List of Duties

(Detailed description of duties, pars. 55–57.)

a. Opens and closes breech, assisted by No. 3.

b. Cleans breach after each round, assisted by No. 3.

c. Unfolds and retracts loading trough, assisted by No. 3.

d. Guides the projectile to proper position on the loading trough, assisted by No. 3.

e. Fuzes the projectile, assisted by No. 3.

f. Places the powder charge in the chamber.

g. Announces "Loaded."

h. Inspects bore and announces "Bore clear."

55. Fuzes Projectiles

The projectile having been placed on the loading trough, No. 2, assisted by No. 3, unscrews the eyebolt lifting plug from the fuze socket of the projectile, inspects the socket for rust and dirt, removes (or replaces) the supplemental charge if necessary, and screws in the designated fuze. In tightening or removing the fuze of a projectile, only the authorized fuze wrench should be used. VT fuzes should be screwed in by hand

and tightened with fuze wrench M18, using only manual force. *Do not hammer on the wrench or use an extension handle.* If a time fuze is used, No. 2 removes the safety pull wire from the fuze and, if a booster is present, the safety pin from the booster. Boosters without safety pins must not be used. To set the fuze to the expected time of flight, use the fuze setter M28 (fig. 45).

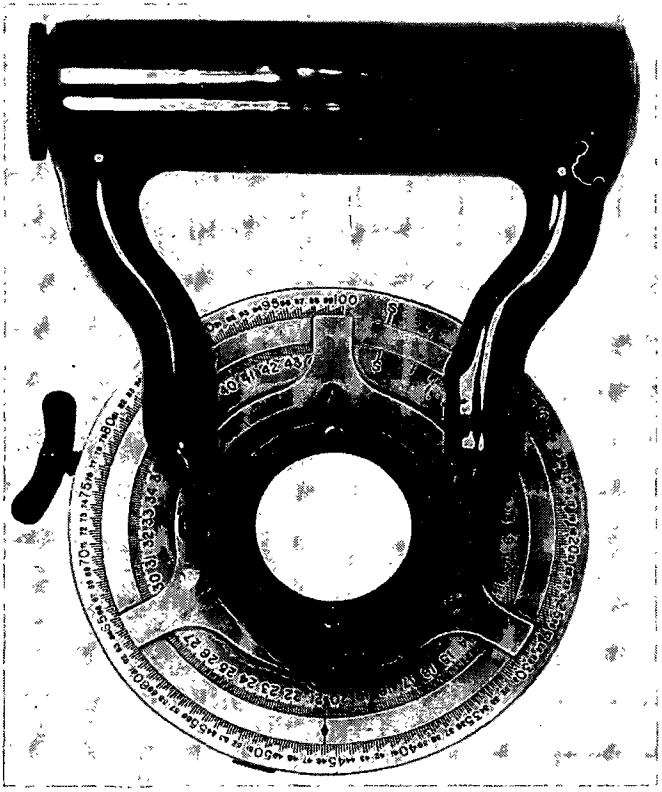


Figure 45. Fuze setter M28.

56. Cleans Breech After Each Round

No. 2 swabs the face of the obturator spindle after each round with a water-saturated cloth. In addition, he passes the vent cleaning bit through the obturator spindle vent several times. From time to time and as necessary, No. 2 wipes the threaded sectors of the breech recess and breechblock with a cloth *slightly dampened* with oil, lubricating, preservative, medium (for temperatures of 32° F. and above) or oil, lubricating, preservative, special (below 32° F.). When necessary, he oils the operating parts of the breech mechanism with the same oil as specified for the breech recess and breechblock.

57. Inspects Bore and Announces "Bore Clear"

No. 2 inspects the chamber and bore after each round is fired to make certain that the chamber is clear and that the bore is free from any residue from the charge. He calls out, "Bore clear," if it is clear.

58. No. 3, List of Duties

(Detailed description of duties, pars. 59 and 60.)

a. Assists No. 2 in opening and closing the breech.

b. Assists No. 2 in cleaning the breech after each round.

c. Assists No. 2 in unfolding and retracting the loading trough.

d. Assists No. 2 in placing the projectile on the loading trough.

e. Assists No. 2 in fuzing the projectile.

f. Assist No. 2 in placing the powder charge in the chamber.

g. Inserts the primer.

h. Attaches and removes the lanyard.

i. Fires the gun.

59. Inserts Primer

When inserting a new primer into the holder, the precaution of keeping the right hand clear of the front end of the primer must be observed. No. 3 must be sure the primer seats against the extractor and when the hammer is rotated that it rests against the firing pin in the wedge.

Caution: The firing cable should be placed on the terminal of the firing lock as the last step prior to dismounting from the gun.

60. Fires Gun

After No. 3 has inserted the primer and placed the contact wire on the firing lock, he dismounts from the gun. He then uncoils the lanyard from his firing post to the firing magneto, fastens the lanyard spring clip to the magneto and returns to his firing post. On command of the chief of section, he pulls the lanyard. The post of No. 3 must be located so that the pull on the magneto arm is perpendicular to the long axis of the carriage. If the gun is to be fired electrically, connecting the wires to the terminals of the electrical impulse is the last step prior to firing.

61. No. 4, List of Duties

(Detailed description of duties, pars. 62 and 63.)

a. Operates the loading davit, assisted by No. 6.
b. Controls the power switch.
c. Passes the powder charges to No. 2.

62. Controls Power Switch

For smooth operation and speed in firing, No. 4 must be alert to apply power when Nos. 1 and 5 call "Power on."

63. Passes Powder Charge to No. 2

As the projectile is being seated in the breech and after the powder charge has been prepared, No. 4 passes the charge to No. 2 in such a manner that No. 2 can grasp the base in his right hand.

64. No. 5, List of Duties

(Detailed description of duties, pars. 65 and 66.)

a. Assists No. 2 in placing the projectile on the loading trough.
b. Rams projectile.
c. When necessary, rams powder charges.
d. Hands lanyard to No. 3.

65. Rams Projectile

To insure that the rotating band of each projectile will be properly seated in the forcing cone, No. 5 must ram each projectile with the same speed and force.

66. When Necessary, Rams Powder Charges

When loading powder charges with the power rammer, as an aid to insure that the powder charges will not be pushed more than 3 inches into the chamber, a chalk mark can be placed on the right side of the buffer, 3 inches from the face of the buffer. When the 3-inch mark reaches the rear face of the chamber, No. 5 retracts the rammer.

67. No. 6, List of Duties

(Detailed description of duties, pars. 68 and 69.)

a. Assists No. 4 in operating the loading davit.

b. Hands fuze to No. 2.

c. Secures davit lifting hook in hook eye.

68. Hands Fuze to No. 2

When handing the fuze to No. 2, No. 6 releases his grip only after No. 2 has a firm grip on the fuze.

69. Secures Davit Lifting Hook in Hook Eye

As soon as the projectile has been loaded, No. 6 secures the davit lifting hook in the hook eye.

70. No. 7, List of Duties

(Detailed description of duties, pars. 71 and 72.)

a. Assists No. 1 in the manual setting of elevations.

b. Passes up swab and cleaning bit to Nos. 2 and 3.

71. Assists No. 1 in Monuol Setting of Elevotions

For each elevation to be set, No. 7 assists No. 1 in operating the manual elevation handwheel. No. 7 stands on the ground facing No. 1 during this operation (fig. 27).

72. Passes Up Swab ond Cleaning Bit to Nos. 2 and 3

After each round has been fired, No. 7 prepares the swab and bit and passes them up to Nos. 2 and 3. For a detailed description of preservative materials to use, see paragraph 56.

CHAPTER 6

TECHNIQUES AND SITUATIONS THAT REQUIRE SPECIAL ATTENTION

73. Mechanical Elevation (Depression)

The hydraulic elevation system includes safety shutoff valves, which are closed automatically as the tube approaches maximum or minimum elevation. For this reason, as the gun approaches 900 mils elevation, the power elevating mechanism will begin to slow down and become noisy as it labors against the closing valve. If No. 1 continues to hold the power switch in engagement after the system begins to *growl,* damage to the mechanism may result from the overload. The same is true of elevations below 90 mils. Cannoneers must resort to hand operation at the upper limits of elevation and below 90 mils.

74. Primary Recoil Locks

If the primary recoil locks are not fully locked when the tube is elevated or the gun is fired, the tube will slide or recoil out of battery. Therefore, immediately after the tube is winched into battery, the chief of section should insure that the pointers on the primary recoil locks are alined with their "locked" indexes.

75. Turntable

When the gun is limbered, the turntable should have so little pressure on the rail from the cross-level jack rollers that it will rotate freely on the ball-and-socket joint. Excessive pressure by the cross-leveling jacks against the rail will either warp the turntable or burr the ball-and-socket joint. To insure that excessive pressure is not exerted by the jacks, Nos. 6 and 7 should turn the cross-level jacks up until the rollers are clear of the rail and then turn them down by hand until they rest lightly on the rail. This should be done prior to fastening the turntable lock. If very rough terrain is to be traversed or if the gun is to be loaded over a steep ramp, it is advisable to unlock the turntable lock until the obstacles have been cleared. This precaution may relieve stresses on the lock so that it is not broken if the turntable strikes an obstruction. This should be done only as a temporary measure; as soon as the conditions warranting it no longer exist, the lock should be fastened.

76. Platform Pit

If extremely high elevations are fired with super or high charge, the servicing platform extends down far enough to jam into the ground when the gun recoils. To prevent damage to the platform when firing at extremely high elevations, it is necessary to dig a pit beneath the platform and extend it back to the limit of the secondary recoil.

77. Receptable Box

All switches and controls for power operation are turned off when the gun has been prepared for travel. After traveling and when preparing for action, a precautionary check must be made to insure that all switches are off before the power transmission cable is plugged into the receptacle box. *Under no circumstances will the cable be plugged in until the gun has been locked in battery.*

78. Signals

Hand signals should be used as much as possible. Not only do they contribute to a more orderly and efficient drill, but they can also be understood amid the noise of the transporter engines. Hand signals in FM 21–60 that are applicable to 280-mm gun operations should be adopted. Additional hand signals for which there is a need should be kept simple and precise and yet be descriptive and understandable.

79. Turntable Anchors

On firm ground, the recoil causes a negligible amount of turntable *creep,* however, anchor assemblies should always be used to prevent damage to the rear float assembly due to rearward movement of the carriage during firing. The anchors are emplaced, one to the direct front and one on either side of it, fanning out at 45° angles from the front (fig. 46). On weapons having anchor stake **T**-slots through the turntable, stakes are driven into the ground through the slots pro-

vided. Manual traversing will be necessary to make the front and rear slots accessible.

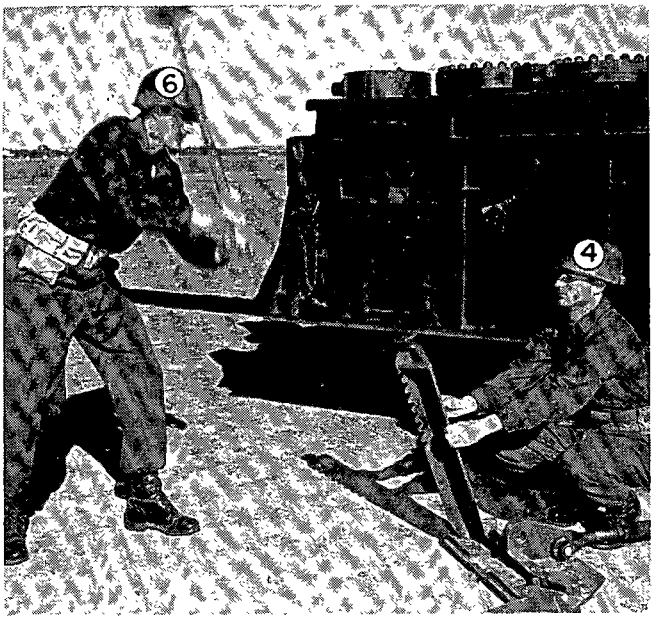


Figure 46. Emplacing anchor stakes.

80. Manual Operations

Except as specified in paragraph 73, manual operations should be used only in the event of a power failure. Should the generator be inoperative, elevation is accomplished with the elevation handwheel, and ramming is accomplished by cannoneers with the rammer staff. If power failure leaves the rammer in the extended or ram position, use the rammer crank to "retract" the rammer.

Caution: *Do not* use the rammer crank to ram a projectile. Use of the rammer crank for this purpose could cause the entire stroke control mechanism to be thrown out of adjustment.

81. Timesavers

a. Cable. As the cable is unreeled from the winch spool to be threaded on the sheave to pull the tube into battery, No. 2 may fasten the end to the pulling eye as soon as the end reaches that point. The cable continues to be unreeled and is passed to No. 5 already doubled. This saves the two-way trip for the end of the cable.

Caution: Do not twist, cross, curl, or kink the cable. If the cable tends toward any of these characteristics, be safe and perform the operation in the prescribed manner.

b. Shackles. If speed in getting the transporters away from the gun position is essential, the shackles may be drawn up after the transporters have been driven away from the gun. In march order the shackles may be lowered while other preliminary operations are being performed.

Caution: Damage to the hydraulic lifts will result if the shackles are permitted to dangle and bump from side to side as the transporter travels over uneven terrain. If the area is dusty, dust will accumulate on the exposed machined cylinder and premature wear will result.

82. Bore Cleaning

a. Manual. The bore brush attached to the rammer staff is pushed and/or pulled manually

through the tube to clean it. This method has variations, however, which will expedite the process and even encourage a more thorough cleaning, due to reduction of fatigue on the part of the cannoneers.

b. With Rammer. One such technique is to fashion an adapter for the rammer into which rammer staff sections can be screwed. To clean the chamber region, one section of the staff is fastened to the adapter with the bore brush screwed on the forward end. The rammer is operated forward and backward, thus cleaning the chamber and breech end of the tube. Additional sections are added one by one and the process is repeated until the entire length of the tube has been cleaned.

Caution: The rammer chain has no limiting locking device. Therefore, the operator must stop the forward action of the rammer before the chain unwinds off the reel. For this reason the adapter should be kept in sight of the operator and never allowed to enter the breech. A signal system is necessary when the brush approaches the muzzle, to prevent the brush from clearing the muzzle and hanging up on withdrawal. As an aid, a predetermined limiting mark could be chalked on the chain. After this method is used, it is advisable to run the brush through the bore manually to insure that loosened residue is brushed out.

c. With Vehicle(s). Pulleys may be fashioned on adapters at the muzzle and breech end of the tube so as to guide a rope along the axis of the

bore. Ropes can be fastened on each end of the brush and the brush towed or winched back and forth through the tube (fig. 47). A more elaborate version of the same technique is to rig two additional pulleys adjacent to the gun and parallel to the tube. One end of each rope is tied to the brush as previously mentioned. The other ends are threaded through the pulleys and tied to the front and rear of a vehicle (fig. 48). By moving the vehicle back and forth between the pulleys anchored to the ground, the brush is pulled back and forth through the tube.

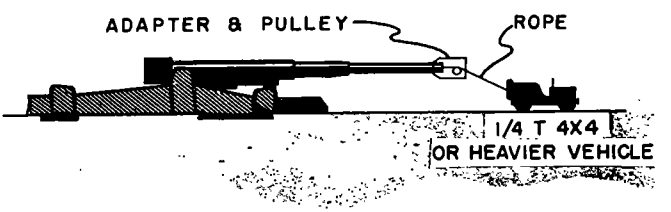


Figure 47. Towing the bore brush through the tube.

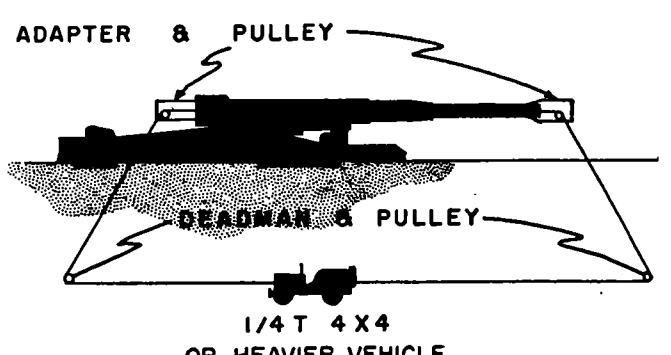


Figure 48. Pulley system for employment of vehicle in cleaning.

83. To Unload Gun

Once a projectile has been rammed it will not be unloaded by battery personnel. When conditions arise making it impossible to fire the gun, the projectile will be unloaded by ordnance personnel only.

84. Winching In or Out of Battery

If the gun is emplaced on a slope, care must be exercised when pulling the tube in and out of battery. By using a 5-ton truck with winch as a braking system, a force can be maintained in a direction opposite to the downhill slope. The weight of the truck being towed effectively diminishes the rate of forward or rearward travel of the tube to allowable safe limits.

Example 1. Winching out of battery, gun emplaced on slope with breech end downhill.

a. Place the truck approximately 50 yards to the right front of the gun, facing the gun, and pay out the winch cable.

b. Carefully aline the truck so the winch cable does not bear on the cradle or counterrecoil buffer cylinders.

c. Thread the cable on the sheave and attach it to the front pulling eye.

d. Take up the winch cable until it is taut; direct the truck driver to maintain a light brake pressure during the retraction of the tube.

Example 2. Winching into battery, gun emplaced on slope with breech end uphill, follow the procedure described in example 1 above except—

a. Station truck to right rear.

b. Hook cable directly to rear pulling eye.

c. Aline the truck so as not to damage the rammer speed control handle.

Example 3. Another method of winching the tube out of battery when the breech end is downhill is to raise the float and place blocks beneath it.

a. With the "A" unit lifting forks, lift the rear of the carriage.

b. When the breech end of the carriage is slightly above level, place two sturdy blocks under the float and parallel to the ends of the float. The blocks should be placed approximately 3 feet from the center of the float.

c. Lower the float to the blocks and unhook the shackles.

d. With the carriage thus supported, proceed with winching the tube out of battery.

Note. If the ground under the float is soft enough to permit the blocks to sink, the method in example 1 above should be used.

85. Transit Used Instead of Plumb Line

As a substitute for the prohibitively long plumb line necessary to facilitate control when sighting through the tube at maximum elevation during the basic periodic test, a transit may be used (par. 128).

a. Preliminary Operations. Level the transit directly in front of the gun at a distance of at least 50 feet. By traversing the gun and adjusting the transit for direction, aline the lines of sight through the transit and through the axis of the bore *exactly.* Clamp the transit direction

mechanism. Throughout the remainder of the operation, the transit will not be rotated.

b. Technique. As the tube of the gun is elevated, the transit operator plunges the transit so as to keep the muzzle vertical hair in view. If the muzzle vertical hair deviates from the vertical line of sight through the transit, the transit operator signals the chief of section to level the piece in the appropriate direction. The tube is then depressed to zero mils elevation. As the tube is elevated, if the muzzle vertical hair again deviates from the vertical reticle of the transit, the transit operator signals the chief of section to have the gun traversed in the appropriate direction until the vertical hair and the reticle are in alinement. This procedure is repeated until the muzzle vertical hair remains in alinement with the vertical reticle of the transit throughout the arc of elevation.

86. Precision in Laying

a. Sighting and laying instruments, fuze setters, and elevating and traversing mechanisms must be properly operated to reduce the effects of lost motion. For uniformity and accuracy the last motion in setting instruments and in laying should be in the direction prescribed in this manual. To insure accurate laying, personnel who lay the gun must be required to verify the laying after the breech has been closed.

b. The line of sight when setting and reading a scale or centering a bubble should be at a right angle to the scale or level vial to prevent parallax errors. Bubbles should be centered exactly.

c. For uniformity and accuracy in laying on aiming posts, the vertical hair in the reticle of the panoramic telescope should be alined with the left edges of the aiming posts.

87. Aiming Points

a. General. After the gun has been laid initially for direction it is referred to the aiming posts and usually to one or more distant aiming points. An aiming point must have a sharply defined point or vertical line clearly visible from the gun so that the vertical hair of the panoramic telescope can be alined on exactly the same place each time the gun is re-layed.

b. Distant Aiming Point. A distant aiming point is one at sufficient distance (at least 3,500 yards) so that normal displacements of the gun in firing or traverse will not cause a horizontal angular change in direction (with the same settings on the azimuth scales) of more than one-half mil. The executive officer usually designates the distant aiming point or points to be used.

88. Aiming Posts

a. Two aiming posts are used for each gun. Each post is equipped with a light for use at night. The most desirable distance from the gun to the far aiming post is 100 yards, considering accuracy of laying, visibility, and ability to control aiming post lights. First the far post is set up and alined. The near post is then set up and alined halfway between the far aiming post and the gun. The vertical hair of the telescope must

be on the left edge of the aiming posts for proper alinement. To insure equal spacing of aiming posts, the distance to both the near and the far post should be paced by the same man. Where ground conditions make pacing inaccurate, the distance from the gun to the posts may be measured using the panoramic telescope and the aiming post as measuring devices (*d.* below).

b. For night use, the aiming post lights should be adjusted so that the far one will appear several feet above the near one. On flat terrain this may be accomplished by using only the lower half of the near post. The two lights placed in this way will establish a vertical line for laying the gun.

c. Since the panoramic telescope is mounted at considerable distance from the center of rotation of the top carriage, large changes in deflection will cause misalinement of the aiming posts. Placing the aiming posts to the left front at a deflection of approximately 2200 when the gun is in the center of traverse will keep this misalinement to a minimum and still allow for maximum visibility.

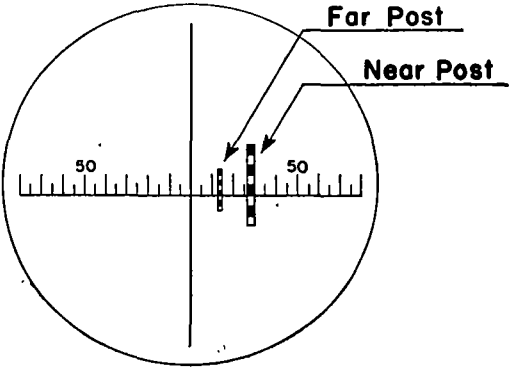
d. To measure the distance from gun to aiming posts the stadia method may be employed, using the panoramic telescope and the aiming post as measuring devices. No. 6 cannoneer, when setting out the aiming posts, holds the upper section of one of the aiming posts in a horizontal position, perpendicular to the line of sighting. The gunner measures the length of this section in mils on the reticle of the panoramic telescope. For example, the upper section of the aiming post is

4½ feet long so that it measures 15 mils when it is 100 yards from the gun. The proper location for the near post, in this case, would be at the point at which the 4½-foot section measures 30 mils. In many cases, the ideal spacing of 50 and 100 yards cannot be obtained but the posts will be properly spaced when the near post is set at a point where one section of the aiming post (4½ ft.) held horizontally measures twice the number of mils it measured at the far post location. This measurement may be performed at night by attaching the night lighting devices on the ends of one section of an aiming post and holding it horizontally.

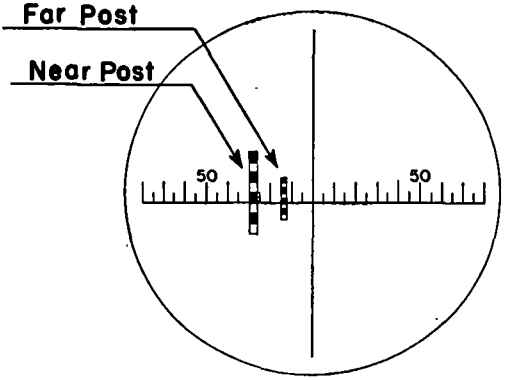
89. Correction for Displacement of Aiming Posts

When the gunner notes that the vertical hair of the telescope is displaced from the line formed by the two aiming posts (or aiming post lights), he lays the gun in such a manner that the far aiming post (light) appears exactly midway between the near aiming post (light) and the vertical hair (fig. 49). If the displacement is due to traversing the gun, the gunner continues to lay as described above. If the displacement is due to progressive shifting of the carriage from shock of firing or other cause, the gunner will notify the chief of section, who, at the first lull in firing, will notify the executive and request permission to realine the aiming posts. To realine, the gun is laid with the far post midway between the near post and the vertical hair (fig. 49). The far aiming post is moved into alinement with the vertical hair of

the telescope, and then the near aiming post is alined. If terrain conditions make it impracticable to move 1 of the 2 aiming posts, the gun is laid for direction and referred to the aiming post



Left Displacement



Right Displacement

Figure 49. Sight picture of aiming posts in proper relationship when correcting for displacement.

that cannot be moved. This deflection is reported to the executive. The other post is alined using the method described in paragraph 44, and the azimuth micrometer scale is slipped to retain the same deflection that was used prior to realinement of the aiming posts.

90. Changing Direction

a. Small Shifts. For small deflection shifts, the gunner traverses the gun with the traversing handwheel (clockwise to shift right, counterclockwise to shift left). The limits of traverse by use of the handwheel are about 133 mils (30 turns) to either side of the center of traverse.

b. Shifts Slightly in Excess of the Limits of Traverse. If the deflection to be fired is only slightly beyond the limits of the traversing rack of the rear float, it is not necessary to draw all the cannoneers from their duties to push the carriage. The gunner, having traversed to the limits of the rack, may have No. 6 operate the rear jack in the conventional manner and then, by turning the handwheel in the opposite direction, "walk" the suspended rear float. When sufficient traverse is gained, No. 6 lowers the float, and the gunner continues to set the announced deflection.

Caution: The tube should be depressed to 0° on the protractor scale prior to operating the lifting jack.

c. Large Shifts. When the deflection shift exceeds the limits of the gear rack on the rear float, the gunner signals No. 6 to operate the rear jack. No. 6 turns the jack clockwise by hand until the

roller is lowered to the turntable rail (fig. 50). He then inserts the jack handle, engages the ratchet, and, assisted by No. 4, continues to turn the jack until the rear float is raised clear of the ground (fig. 51). When it has been determined that the generator cable is placed so that it will not be damaged by the shift, section personnel push on the side of the carriage so that the gun is shifted in the desired direction (fig. 52). On signal of the gunner, the shifting is stopped, and No. 6 turns the jack counterclockwise to lower the rear float to the ground. As a precaution to

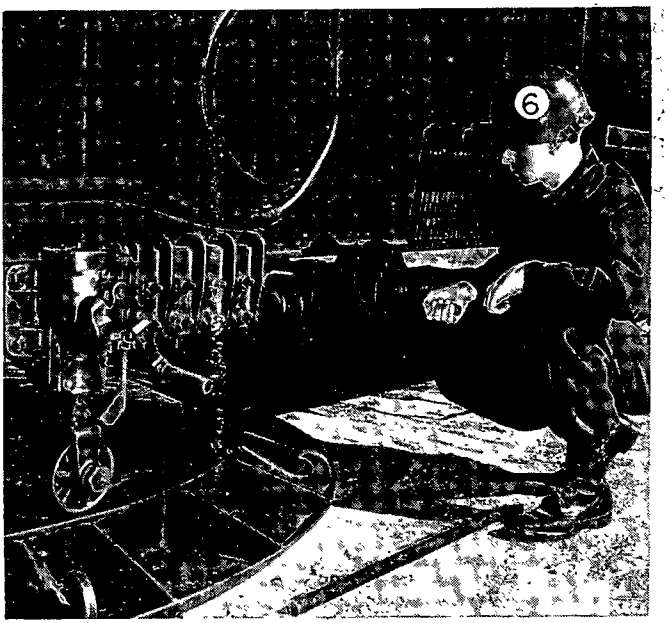


Figure 50. No. 6 lowering float lifting jack.

insure against damage to the jack, No. 6 continues to turn the jack until the roller is about 4 inches above the rail. If there is reason to believe that the ground under the turntable is not level, the chief of section will signal Nos. 6 and 7

Figure 51. Nos. 4 and 6 operating float lifting jack crank.

to operate the cross-level jacks as he cross-levels the gun with the gunner's quadrant.

91. Testing Targets

Testing targets will be more useful if the following improvements are made:

a. The target should be mounted on a flat piece of masonite, wallboard, or similar material.

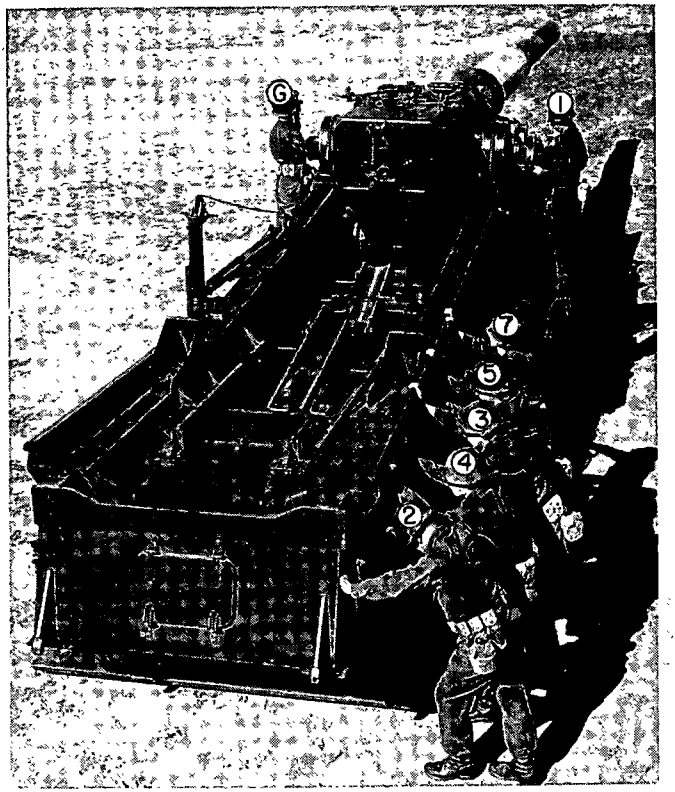


Figure 52. Section personnel shifting direction of gun.

b. To insure stability of the testing target throughout boresighting, it should be fastened to a stand in a manner similar to that shown in figure 53.

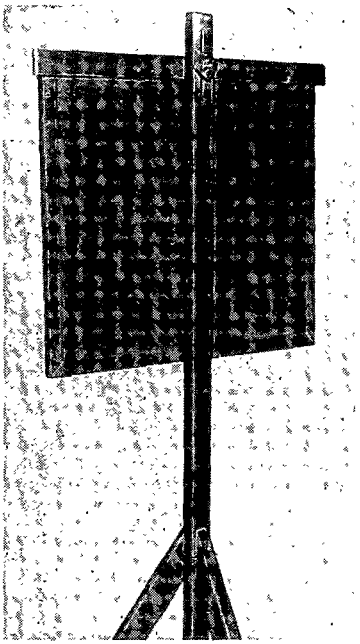


Figure 53. Rear view of boresighting target stand.

c. For use in either leveling or canting the test target, a mil scale may be inscribed at the bottom of the target. A small nail at the top marks the center from which the arc was drawn and provides a hook from which to suspend the plumb line (fig. 54).

d. Vertical reference lines may be drawn through the centers of each of the diagrams (fig.

54). These lines may be used when the trunnions cannot be leveled, by setting the test target with the cant angle of the gun. The target is rotated until the line of sight through the tube tracks the reference line when the tube is elevated or depressed. Similarly, the panoramic telescope should be adjusted so that its reticle tracks the appropriate reference line when the tube is elevated or depressed.

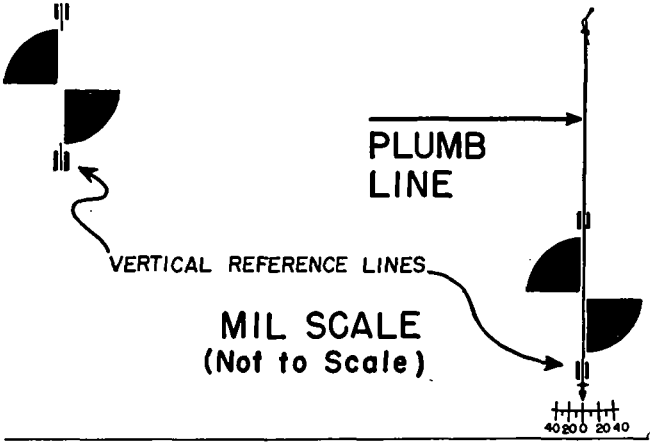


Figure 54. Vertical reference lines and mil scale inscribed on testing target.

e. To facilitate boresighting in darkness, bore a 1/16-inch hole through the mounted testing target at the center of each aiming diagram. A flashlight held against the target behind the appropriate hole provides an aiming point for use in blackout conditions. Fasten patches of felt padding on the back of the target covering the regions of each hole so that light from the flash-

light will not escape. The flashlight must be lit only after it is placed firmly in position. Care must be taken to prevent disturbing the position of the testing target.

92. Cease Firing

The command CEASE FIRING is normally given to the gun section by the chief of section, but in emergencies anyone present may give the command. At this command, regardless of its source, firing will cease immediately. If the gun is loaded, the chief of section will report that fact to the executive. The executive acknowledges this report by saying "No. (so-and-so) loaded." If CEASE FIRING came from the fire direction center, firing is resumed at the announcement of the quadrant. If CEASE FIRING came from within the firing battery, the executive will investigate the condition that caused the command to be given. When corrected, firing is resumed at the executive's announcement of the quadrant.

93. Care of Ammunition

a. To insure uniform results in firing, to prolong the life of the tube, and to avoid accident, great care must be exercised in the storage and handling of ammunition at the battery. Provisions of TM 9–1900 applicable to field service should be followed carefully. In the field, conditions existing in each position will determine the amount of time, labor and materials required to store and preserve the ammunition adequately. If the position is to be occupied for only a few hours, a tarpaulin spread on the ground may be

sufficient; for longer periods of time more elaborate facilities should be provided.

b. Ammunition must be protected from damage. When projectiles are received, they should be sorted into lots and placed in the best available storage. Ammunition data cards should be kept until after all ammunition for that lot is expended. The eyebolt lifting plug should not be removed from unfuzed projectiles until the fuze is to be inserted. Protection should be provided against moisture, dirt, direct rays of sun, and, as far as practicable, hostile artillery fire and bombing. Protection against weather, dirt, and sun may be obtained by the use of tarpaulins and dunnage. Projectiles piled in the open should be raised off the ground by at least 6 inches. If drainage is not good, ditches should be dug around piles. A liberal use of dunnage should be made between layers and covering tarpaulins should be raised from the stack at least 6 inches to insure adequate ventilation. Each stack should contain not more than 50 rounds and should be not more than 3 layers high. Stacks should be at least 10 yards apart.

c. Powder charges should be sorted into lots and protected from sources of high temperatures, including direct rays of the sun. More uniform firing is obtained if the charges are of the same temperature. Powder charges arrive at the battery in metal containers. The tops of these containers are sealed with rubber gaskets. These containers should not be opened until needed; i. e., the containers are taken to the gun unopened

and are opened as the projectile is being fuzed and rammed. When it is necessary to measure powder temperature, only one container is opened and the thermometer is inserted. After the temperature has been taken the container is taped at the junction where the seal was broken.

d. Explosive elements in primers and fuzes are particularly sensitive to shock and high temperature, therefore strict attention should be given to their care and handling. Protection and safety devices should not be removed from fuzes until just before use. No attempt should ever be made to disassemble a fuze into its components.

e. For further information on care of ammunition, see FM 6–140, TM 9–338–1, TM 9–1900, and TM 9–1901.

94. Section Data Board

When positions are occupied for more than a few hours, data boards may be used by each section for recording such items as deflections to aiming points, calibration corrections when appropriate, minimum elevations, data for barrages and counterpreparations, and other data which may be needed quickly. If such information assumes a standard pattern, the section may paint a form on the shield or on the inside of the hull and chalk in the various items of information in the appropriate spaces.

CHAPTER 7

BORESIGHTING

Section I. GENERAL

95. Description

Boresighting is the process of verifying that the alinement of the oncarriage fire control equipment is parallel with the axis of the tube of the weapon, both for deflection and, except for the aiming circle method, for elevation. Any misalinement discovered through boresighting is corrected as described in paragraphs 99 through 102. The gun should be placed near its center of traverse prior to boresighting. All instruments and mounts must be positioned securely; there must be no free play. Boresighting is conducted before firing and when necessary during lulls in firing.

96. Equipment

The following equipment is needed for boresighting:

a. Boresights. Front and rear boresights or improvised substitutes are necessary for all but the standard angle method, for boresighting. If boresights are not available, cross hairs may be fastened on the muzzle, and the obturator spindle vent hole in the breechblock bushing may be used as a rear sighting guide.

b. Testing Target. A testing target or suitable substitute is needed for preparatory steps in testing and for certain methods of boresighting. If a testing target is not available, a clearly defined aiming point 3,500 or more yards from the gun may be used to accomplish approximately the same purpose as the testing target.

c. Tools. The section equipment includes all the necessary tools for boresighting and testing. Care must be taken in using the screwdrivers and wrenches to insure that damage does not result through carelessness or the use of inappropriate tools.

97. Leveling

Although it is not absolutely necessary to level the trunnions for boresighting, it is advisable to do so whenever possible. Accurate results can be obtained more readily if the trunnions are level, because then a tilt corresponding to the cant does not have to be introduced in the telescope mounts and the testing target when used. To level the gun, the tube is first leveled longitudinally and then cross-leveled. Leveling may be measured by placing the gunner's quadrant on the leveling plates on the breech ring. In no case should there be more than 20 mils cant.

a. Plumb Line. The best method to check leveling is by means of the plumb line. The line is suspended directly in front of the axis of the bore. The line of sight should track the plumb line as the tube is depressed and elevated between minimum elevation and the limits described by a

plumb line which is as long as practicable. When the trunnions are level, the line of sight tracks the plumb line exactly through all elevations.

b. Gunner's Quadrant. In leveling operations using the gunner's quadrant, a quadrant that has been tested (pars. 118–122) and found to be accurate is required.

98. Methods

There are four procedures for boresighting this weapon.

a. Testing target method (pars. 99–102).

b. Distant aiming point method (pars. 103–104).

c. Aiming circle method (pars. 105–110).

d. Standard angle method (pars. 111–114).

Section II. TESTING TARGET METHOD

99. General

This method consists of boresighting, using the aiming diagrams of the testing target as aiming points. The preliminary steps to follow are—

a. Trunnions. Check the level of the trunnions.

b. Boresights. Place the cross hairs on the muzzle and either insert the breech boresight or use the obturator spindle vent hole.

c. Testing Target Alinement. The target normally should be located at least 50 yards in front of the muzzle. If the trunnions are level, level the testing target by means of a plumb line or the vertical reference lines. If the trunnions are not level, cant the target to correspond to the cant

of the trunnions. In either case, the face of the target is perpendicular to the axis of the bore, both laterally and longitudinally. Without moving the gun (except for elevating and depressing slightly when using testing target reference lines), aline the gun tube testing target diagram with the line of sight through the tube (fig. 55).

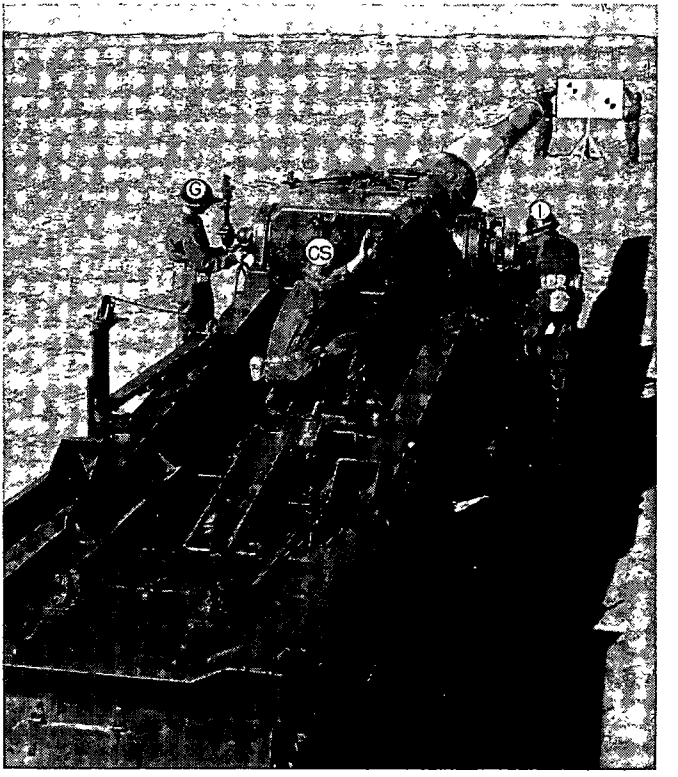


Figure 55. Alining testing target.

d. Telescope Mount. Level the telescope mount in both directions by centering both level bubbles.

100. Panoramic Telescope Lateral Alinement

Set the panoramic telescope scales at zero (par. 39). If the vertical reticle is not in alinement with its aiming diagram, loosen the tangent locking screws and adjust the tangent screws until the vertical hair is properly alined. Tighten the locking screws and verify the adjustment.

101. Panoramic Telescope Horizontal Alinement

If the horizontal reticle is out of alinement, turn the elevation knob of the telescope until the hair is alined properly. Loosen the clamping screws and rotate the scale (zero) into coincidence with the fine elevation indexes. Tighten the clamping screws and verify the adjustment.

102. Elevation Quadrant

With the trunnions cross-leveled, using a corrected gunner's quadrant on the breech ring, lay the weapon at 300, 600, and 900 elevation. At each position, measure the elevation with the elevation quadrant M1 and record the error, if any. If the error is not constant, refer the weapon to ordnance for repair. If the error is constant, proceed as follows:

a. Elevate the piece to any even elevation (300 mils is convenient), using the gunner's quadrant on the breech ring longitudinal-leveling plates.

b. Cross-level the elevation quadant M1.

c. Center the longitudinal-level bubble of the

elevation quadrant M1 by means of the micrometer knob.

d. The elevation scale should read 300 mils. If the scale is out of adjustment, loosen the three screws in the micrometer knob and slip the scale till the zero is opposite the index. Tighten the screws and verify the adjustment. If the scale is out of adjustment enough to cause confusion in reading the 300-mil graduation proceed as in *e* through *h* below.

e. Set the scale to read 300 mils and the micrometer to read zero.

f. Loosen the clamp nut and 2 clamp screws which clamp the level bracket and 2 lockscrews that lock the longitudinal vial adjusting screws.

g. Turn the vial adjusting screws until the vial is perfectly centered being sure that the screws are just snug enough to allow no free play. Tighten the locking screws.

h. Tighten the two clamp screws and the clamp nut and verify the adjustment of the bubble in the vial.

Section III. DISTANT AIMING POINT METHOD

103. General

The elevation quadrant is alined as in paragraph 102. This method consists of alining the oncarriage fire control equipment and the line of sight through the tube on a common point at least 3,500 yards from the gun. If the moon or a star is used as an aiming point, care must be taken that the lines of sight through the tube and the telescope are on the same point at the

same time. Accurate cross-leveling of the trunnions is unnecessary when boresighting on a distant aiming point because the lines of sight converge on a single point.

104. Procedure

The steps to be followed in boresighting on the distant aiming point are—

a. Level the trunnions approximately.

b. Place the cross hairs on the muzzle and either insert the breech boresight or use the obturator spindle vent hole.

c. Set the panoramic telescope scales at zero.

d. Traverse and elevate until the line of sight through the tube is exactly on the distant aiming point.

e. Sight through the panoramic telescope and note the position of the vertical and horizontal hairs of the reticle.

f. If the vertical hair is off the aiming point, loosen the tangent locking screws and adjust the tangent screws until the vertical hair is properly alined. Tighten the locking screws and verify the adjustment.

g. If the horizontal hair is off the aiming point, turn the elevation knob until the hair is properly alined. Loosen the clamping screws and shift the zero into coincidence with the index. Tighten the clamping screws and verify the adjustment.

Section IV. AIMING CIRCLE METHOD

105. Preliminary Operations

Before boresighting with the aiming circle, certain preliminary operations and preparatory

steps must be performed, preferably after a basic periodic test (ch. 8) when the panoramic telescope mount is in correct adjustment. The greatest care must be exercised in all phases of these steps. All final movements of the instruments must be made so that the hair of the reticle approaches the final position from left to right, in order to eliminate the effects of lost motion in the gears.

106. Parallax

Parallax in the aiming circle and the panoramic telescope must be eliminated. This is done with the aiming circle after focusing by placing in front of the eyepiece lens a dark-colored cardboard or metal parallax shield of the same diameter as the eyepiece lens housing. The shield should have a vertically and horizontally leveled slot one-sixteenth of an inch wide and one-fourth of an inch long. It is held in place with a piece of adhesive tape around the edge of the focusing sleeve. To eliminate parallax in the panoramic telescope, a shield of the same diameter as the eyepiece lens housing and having an exactly centered hole one-sixteenth inch in diameter is mounted in front of the eyepiece lens. A more permanent parallax shield may be constructed of brass or bronze shim stock. When constructed of metal, a series of fingers approximately three-sixteenths of an inch wide and one-fourth of an inch long separated by ¼-inch spaces should extend beyond the perimeter of the shield. These fingers should be bent along the circumference of the circle until

they form an angle of 90° with the surface of the shield (fig. 56). They serve as a means of clipping the shield in place quickly and permit easy removal. If the eyepiece has a rubber eyeguard, the fingers permit alinement within the guard without its removal.

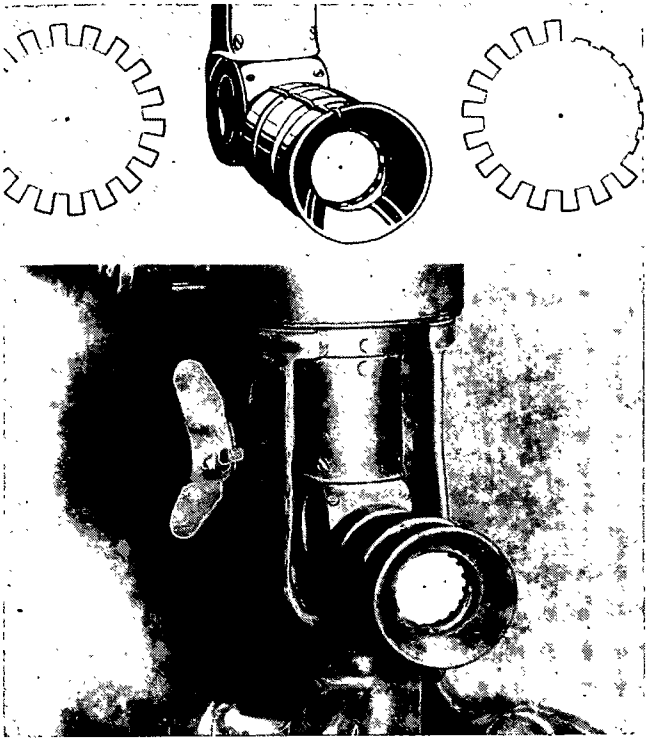


Figure 56. Parallax shield.

107. Boresight Marks

The aiming circle method requires that boresight marks be located on the top surface of the

tube at the muzzle end and on the rear of the breech ring (fig. 57). The position of these boresight marks must be accurately defined by painting a white stripe about 1 inch wide and several inches long on the tube and from the top of the breech ring to the breechblock carrier. The left edge of the stripe lies in the same vertical plane as the exact center of the bore when the trunnions are level. The location of boresight marks is determined as follows:

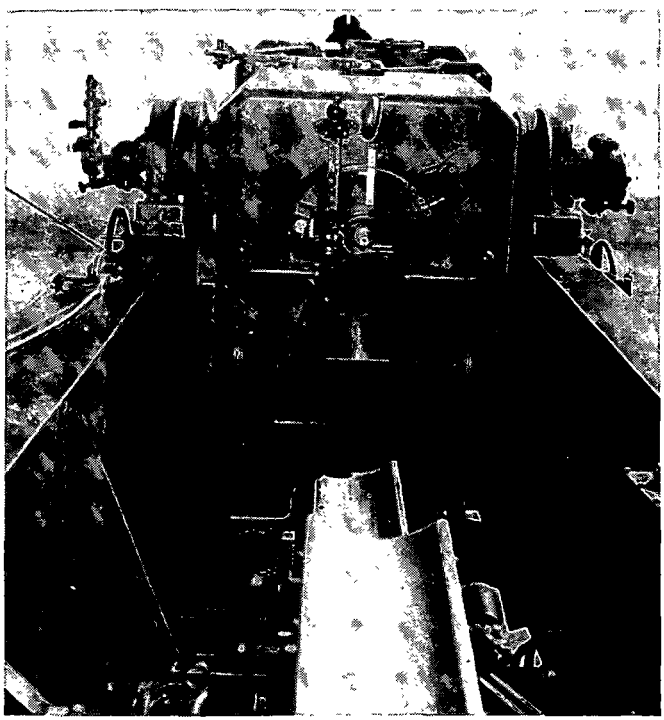


Figure 57. Boresight marks.

a. Level the trunnions.

b. Set up an aiming circle equipped with a parallax shield directly in rear of the gun at a distance that will permit sighting through the tube when the weapon is at minimum elevation.

c. Fasten cross hairs in the muzzle witness marks.

d. With adhesive tape, fasten a bright common pin in the top witness mark so that it projects above the muzzle.

e. Place the breech boresight in place. If the breech boresight is not available or if vision through the center hole is difficult, a strip of wood placed vertically in the breech may be used. This strip must have the horizontal center marked, and its edge must be on the vertical center of the breech.

f. Sight through the aiming circle and, if necessary, traverse the gun until the breech boresight or the wood strip and the vertical thread on the muzzle are alined with the right edge of the vertical hair of the aiming circle.

g. Place a straightedge in a vertical position on the rear face of the breech ring and aline the right side of the straightedge with the hole of the breech boresight or the edge of the wood strip and the right edge of the vertical hair of the aiming circle. Draw a pencil line along the side of the straightedge on the upper rear portion of the breech ring (fig. 58).

h. Remove the breech boresight and close the breech. Using the straightedge and the same line

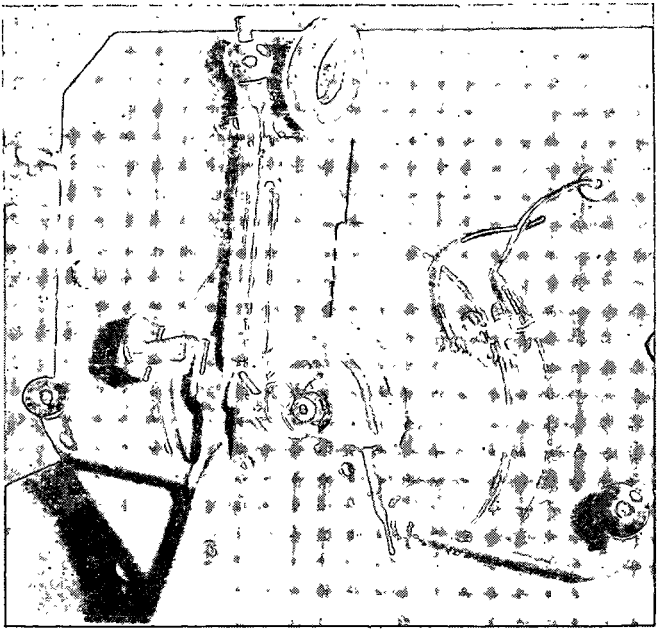


Figure 58. Pencil line for breech boresight stripe.

of sight (fig. 58) extend the pencil line (*g* above) to the breechblock carrier.

i. Without changing the horizontal direction of the aiming circle or traversing the gun, elevate the gun until the pin and part of the top of the muzzle is clearly visible.

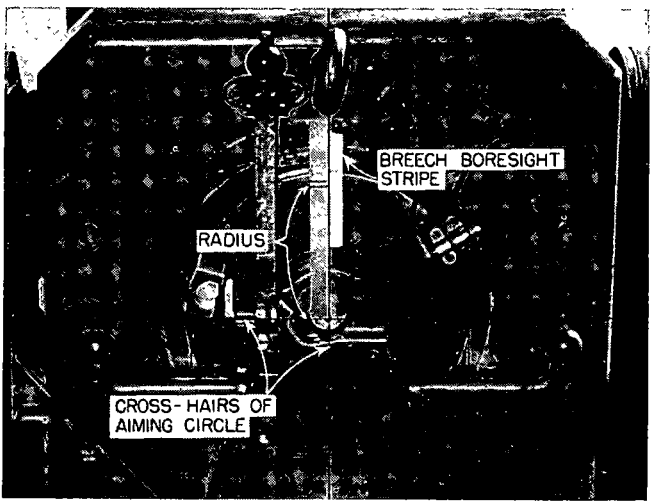
j. Lay the straightedge atop the tube at the muzzle along the same line of sight and draw a pencil line.

k. Paint the white stripes on the tube and breechblock so that the left edge of the stripes are exactly on the pencil lines.

l. Depress the tube and adjust the elevation knob of the aiming circle until the cross hairs of the muzzle boresight and the hole of the breech boresight are centered on the cross hairs of the aiming circle reticle.

m. Measure the *outside* diameter of the muzzle with a ruler. Divide this measurement by 2, thereby obtaining the radius. Mark this distance off on the straightedge.

n. Place the right edge of the straightedge (*h* above) along the left edge of the breech boresight stripe, the base of the straightedge (radius) resting on a line where the aiming circle horizontal hair falls across the breech (fig. 59①). Keeping the straightedge in place, move the hori-

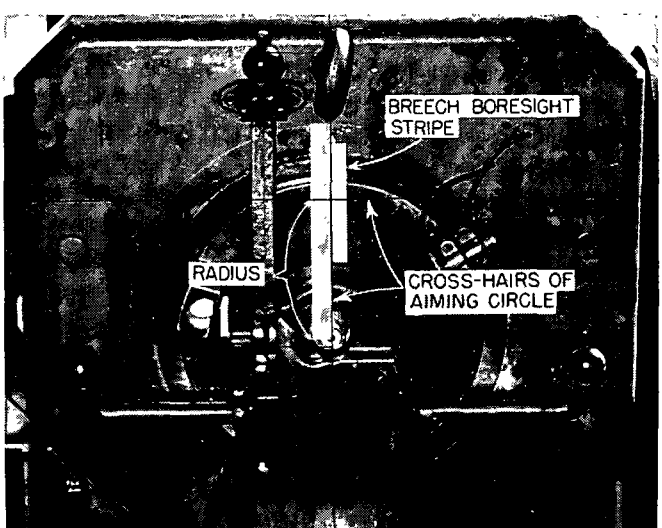


① Alining the base of the radius with the horizontal hair of the aiming circle

Figure 59. Locating the radius point.

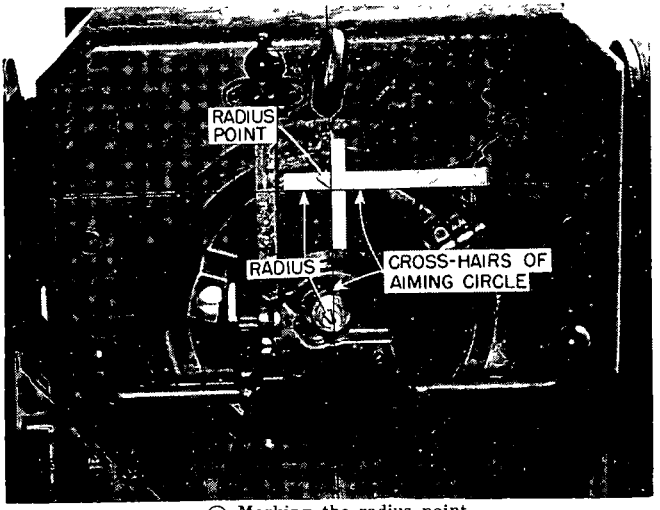
zontal hair upward until it falls across the top of the radius mark on the straightedge (fig. 59②), by turning the elevating knob of the aiming circle. Then turn the straightedge horizontally against the breechblock, alining its lower edge along the horizontal hair of the aiming circle (fig. 59③). Mark the point where the lower edge crosses the left edge of the breech boresight stripe (fig. 59③). This is the radius point.

o. To make the point easy to identify, paint a short white stripe to the left, the top of the white stripe falling on the pencil line (fig. 59④).



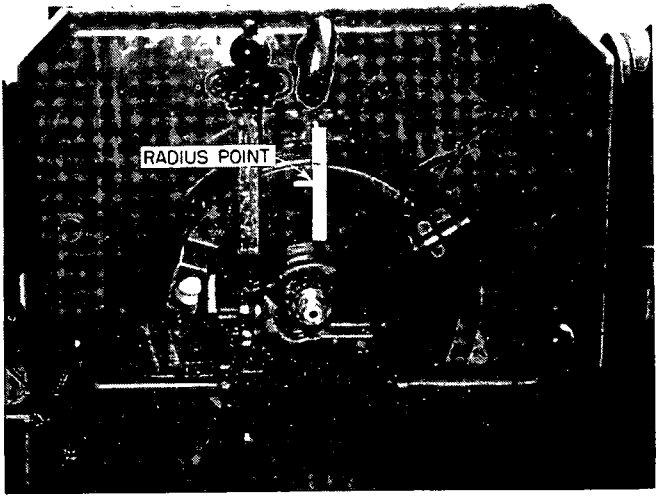
② Alining the horizontal hair of the aiming circle with the top of the radius

Figure 59—Continued.



③ Marking the radius point

Figure 59—Continued.



④ Radius point on breeching stripe

Figure 59—Continued.

108. Procedure (Trunnions Level)

The gun having been prepared as in paragraphs 105 through 107, at any later time it may be boresighted by the aiming circle method, as follows:

a. Set up the aiming circle 100 yards in rear of the gun.

b. Zero the aiming circle's scales and level the instrument.

c. Elevate the gun until the two boresighting marks are plainly visible from the aiming circle. Do not elevate the tube any more than is necessary for clear definition of the edges of the white boresight marks.

d. By traversing the gun and turning the lower motion of the aiming circle, place the right edge of the vertical hair exactly in line with the left edge of the two boresight stripes.

e. Check to see if the trunnions are level by elevating and depressing the tube and noting if the two boresight stripes remain parallel to the right edge of the vertical hair of the aiming circle. If the trunnions are level, the radius point is not used. Proceed with steps *f* through *j* below. If they are not level, proceed as in paragraph 109 below.

f. Verify that the cross-level and longitudinal-level bubbles are leveled, that the azimuth scales of the telescope are set at zero (3200), and that the indexes are in coincidence.

g. With the upper motion of the aiming circle, turn to the objective lens of the panoramic telescope. Make certain that equal amounts of the

housing appear on each side of the vertical hair.

h. Read the angle on the azimuth scales of the aiming circle.

i. Set the angle from the aiming circle (*h* above) on the azimuth micrometer scale of the panoramic telescope.

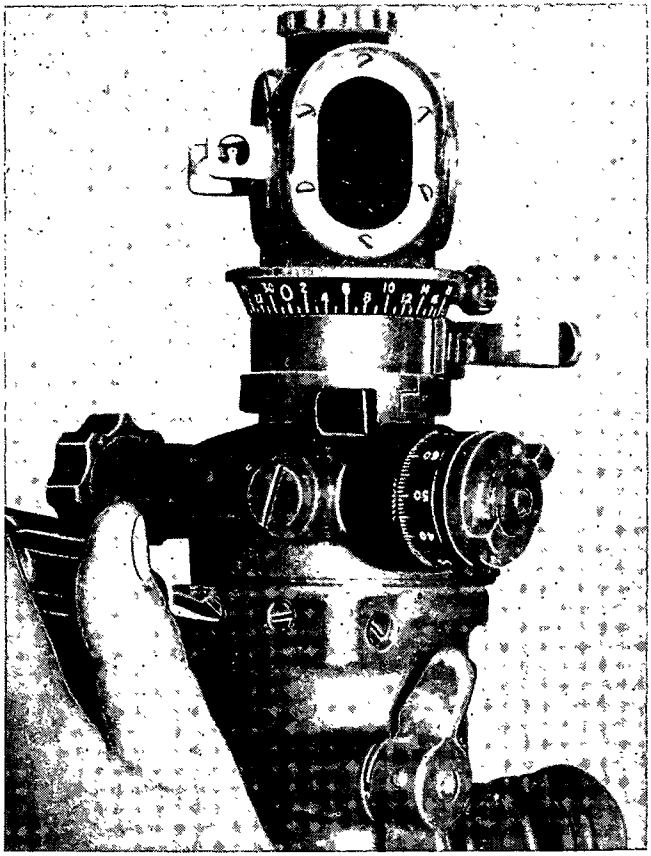


Figure 60. Loosening a tangent locking screw.

j. Loosen the tangent screw locking screws (fig. 60) and adjust the tangent screws (fig. 61) until the vertical hair of the telescope is exactly on the center of the objective lens of the aiming circle. Tighten the locking screws and recheck the angle settings and the alinement of the vertical hairs.

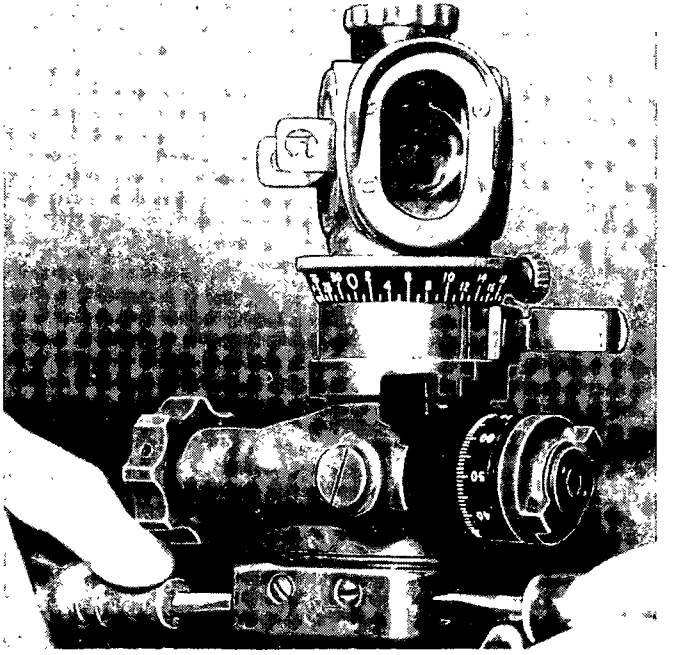


Figure 61. Adjusting the vertical hair of the reticle with tangent screws.

109. Procedure (Trunnions Not Level)

a. Follow the steps set forth in paragraph 108*a* through *e*. Sighting on the boresight stripes

must be made at prescribed points on the stripes when the trunnions are not level. The right edge of the vertical hair of the aiming circle must be alined with the top left edge of the muzzle boresight stripe and with the radius point on the left edge of the breech boresight stripe. These two points are equally distant from the axis of the bore. If this is not accomplished, the line of sight through the aiming circle will not be parallel to a vertical plane through the axis of the bore, and an error in alinement will result.

b. Verify that the cross-level and longitudinal-level bubbles are level. Proceed as described in paragraph 108*g* through *j*

110. Elevation Quadrant Alinement

The elevation quadrant is alined as in paragraph 102.

Section V. STANDARD ANGLE METHOD

111. General

When conditions exist to make other methods of boresighting impracticable, the standard angle method may be used (pars. 112–114). In this method, the alinement of the optical axis of the panoramic telescope parallel to the axis of the bore is tested and adjusted by referring to a selected point on the muzzle. The deflection and elevation angles necessary to refer the line of sight of the telescope to the selected point on the muzzle are referred to as the standard angles. Once standard angles have been determined, they may be used for a quick test of the alinement of the

panoramic telescope when more precise methods cannot be used. Misalinement discovered and corrected as a result of this test should be verified by a more accurate method at the earliest opportunity. When using the standard angle method of boresighting, the position of the recoiling parts with respect to the nonrecoiling parts must be the same as when the standard angles were determined. Because of this, the recoil system must be checked to see that it contains the proper amount of recoil oil before determining the standard angles. Standard angles are usable only as long as the same tube-carriage combination is intact. If interchange of tubes or carriages is made, standard angles must be reestablished.

112. Preliminary Operations Standard Angle Method

The ideal time to determine standard angles for later use is after performing basic periodic tests, when the trunnions are level and the panoramic telescope mount has been found to be in correct alinement. Procedure for determining standard angles is as follows:

a. With the tube in battery, be sure the breech ring is seated against the cradle.

b. Verify that the trunnions are level.

c. With friction tape fasten a bright common pin in the left horizontal witness mark. Allow the pin to project to the left of the muzzle (fig. 62).

d. Fasten the parallax shield over the eyepiece of the panoramic telescope.

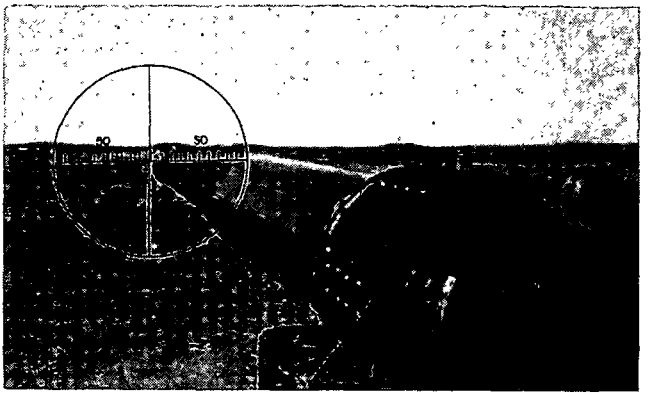


Figure 62. Sight picture of projecting pin.

e. Verify that the coarse and fine elevation knob indexes on the telescope are at zero.

f. Elevate the tube until the metal pin in the left horizontal witness mark is approximately level with the top of the panoramic telescope.

g. Level the bubbles of the telescope mount and refer the telescope to the junction of the pin with the muzzle. Adjust the tube elevation and the telescope angle until, with the bubbles level, the horizontal and vertical hairs of the telescope are exactly on the junction of the pin with the muzzle (fig. 62).

h. Read the deflection from the azimuth scales of the panoramic telescope to the nearest one-fourth mil and record it. (Since the graduations are to the nearest mil, it is necessary to interpolate to the nearest one-fourth mil.) This is the standard azimuth (horizontal) angle for the gun tested.

i. With the gunner's quadrant or elevation quadrant, measure the elevation of the tube to the nearest one-fourth mil. This is the standard elevation (vertical) angle for the gun tested.

j. With the telescope mount set as in *g* above, scribe lines with a knife blade, or other sharp metal point in the paint on the parts of the telescope mount as shown in figure 63. Care should

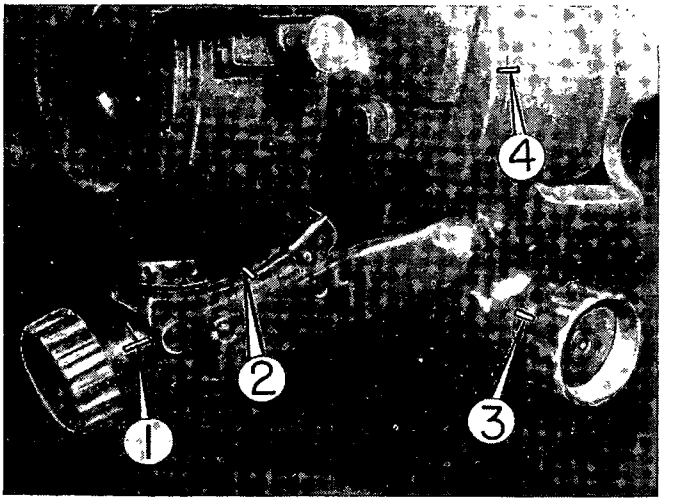


Figure 63. Scribe lines.

be taken that the lines are scribed in the paint only and are not cut into the metal. To establish scribed line 1 in figure 63, scribe the line straight across the junction of the cross-leveling worm knob shaft and the cross-leveling worm housing. This scribed line is the fine cross-level index. The indexes on the cross-leveling segment and

the cross-leveling worm housing (2, fig. 63) are brought into coincidence for coarse cross-leveling. Establish scribed lines 3 and 4. Fill the scribed lines with *red* paint and wipe off the excess. These lines establish control for the telescope mount for use in boresighting with the standard angle method. The positions of the scribed lines are verified at subsequent periodic tests and adjusted if necessary.

113. Procedure Standard Angle Method

Once the standard angles have been determined, steps in performing the standard angle method of boresighting are as follows:

a. Verify that the parts that move in recoil are in the same position with respect to the nonrecoiling parts as they were when the standard angles were determined. If they are not in the same position, the amount of recoil oil in the recoil mechanism must be checked.

b. Verify that the trunnions are not canted more than 10 mils; if feasible, level the trunnions.

c. With friction tape, fasten a pin in the left horizontal witness mark so that the pin projects out to the left of the muzzle.

d. With the gunner's quadrant, set the standard elevation angle and elevate the tube to level longitudinal bubble exactly.

e. Place the parallax shield on the eyepiece of the telescope.

f. Insure that the *red scribed lines* are alined.

Set the standard azimuth angle on the panoramic telescope.

g. If the vertical hair of the reticle is not exactly on the junction of the pin and the muzzle, adjust the tangent screws until the vertical hair of the reticle is properly alined.

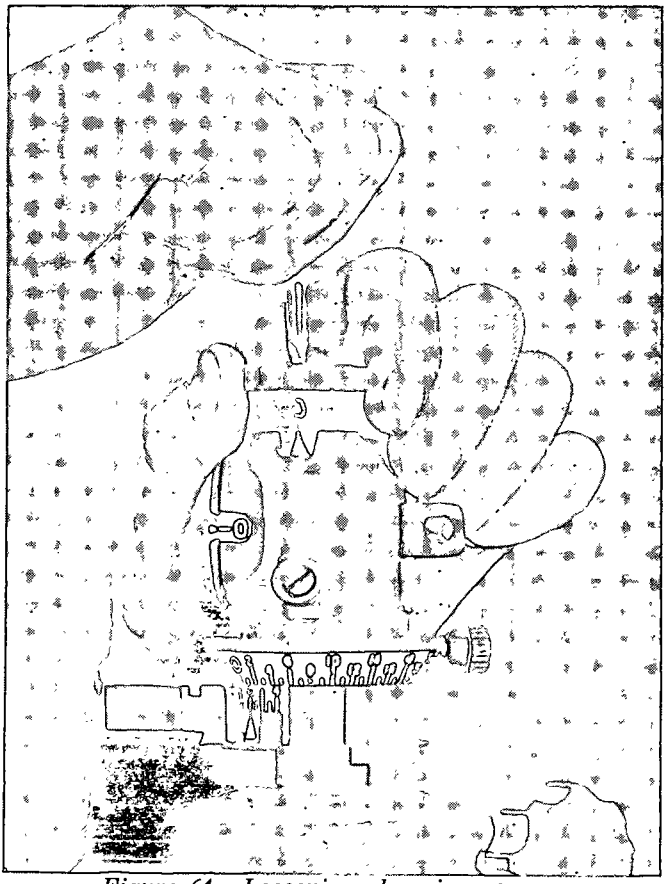


Figure 64. Loosening clamping screws.

h. If the horizontal hair of the reticle is not exactly on the junction of the pin and the muzzle, turn the elevating knob of the panoramic telescope until it is properly alined. If the indexes are not in coincidence, loosen the clamping screws (fig. 64) and adjust the zero of the elevation knob scale so that it is in alinement with the index (fig. 65).

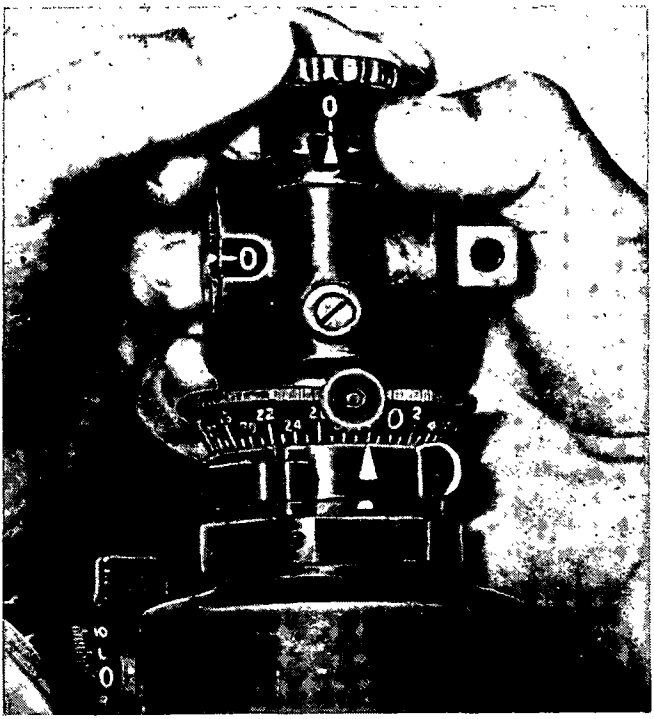


Figure 65. Shifting zero of the elevation knob to its index.

114. Elevation Quadrant

To adjust the elevation quadrant, follow the procedure given in paragraph 102.

CHAPTER 8

BASIC PERIODIC TESTS

Section I. GENERAL

115. Purpose and Scope

a. The purpose of this chapter is to describe the procedures for making basic periodic tests of oncarriage fire control equipment. The procedures covered will include only those that may be accomplished at battery level. It is not contemplated that using units will have the necessary facilities, tools, or skilled personnel to perform the more precise tests and adjustments of sighting and fire control equipment. If the range quadrant, telescope mount, or panoramic telescope exceeds the tolerance authorized on any of the tests outlined, the gun and/or panoramic telescope should be sent to ordnance for adjustment.

b. Basic periodic tests are performed by the section under the supervision of the platoon commander and the artillery mechanic. These tests are performed at the discretion of the unit commander. Suggested times for performance are —once each year if the gun is used for nonfiring training; once every 3 months if the gun is fired; as soon as possible after extensive use, accidents, interchange of tube or carriage, or traversing extremely rough terrain; and whenever the gun

fire inaccurately for no readily apparent reason. The tests reveal whether or not the oncarriage sighting equipment, the gunner's quadrant, and the fuze setter are in correct adjustment.

116. Preliminary Conditions

For the oncarriage equipment to be in correct adjustment, the following conditions must exist:

a. The line of sight of the panoramic telescope remains in a plane parallel to the vertical plane passing through the axis of the bore as the weapon is elevated through its limits of elevation.

b. All indexes and scales read zero.

c. If the sight mount longitudinal-level bubble is kept centered, the cross-level bubble remains centered throughout the limits of elevation of the tube.

d. The sight mount longitudinal-level bubble remains centered when the movable cross-level segment is operated throughout its limits.

e. The sighting equipment is accurately boresighted as described in chapter 7.

f. Prior to all tests of oncarriage fire control equipment, it is essential that the trunnions be level. Leveling the trunnions is most easily accomplished as prescribed in paragraph 97. The best check to see that the trunnions are level is that the axis of the bore tracks a plumb line as described in paragraph 97*a*. If a plumb line cannot be used, approximate leveling may be accomplished with the gunner's quadrant atop the leveling plates on the breech ring.

117. Plumb Line

It is essential that a plumb line or an improvised substitute be used in the basic periodic test. When using a plumb line in conjuction with the basic periodic test, strive to make the line as long as possible. The line provides vertical control to which the line of sight through the tube is referred at various elevations. Thus, the longer the line, the higher the tube elevations possible; the higher the tube elevations, the more complete the test. To keep a long plumb line taut, it may be necessary to add weight to it. Wrenches or rocks may be used. The tendency of the weight to swing may be decreased by placing a bucket containing water or other liquid under the plumb line so that the plumb bob or other weight is partially immersed in the liquid. A plumb line strung from a building or tree is desirable to gain the height that is needed for the line. Units in garrison may find it convenient to rig a plumb line on a tall building. The line may then be nailed in place so that it can be used permanently.

Section II. TEST OF GUNNER'S QUADRANT

118. General

The gunner's quadrant must be in proper adjustment before conducting tests and adjustments of other sighting and fire control equipment. Inspect the shoes of the gunner's quadrant for dirt, nicks, or burs. Similarly, inspect the leveling plates on the upper surface of the breech ring and the gunner's quadrant seat of the telescope mount.

Dirt, nicks, or burs on these surfaces will cause the instrument to give inaccurate readings.

119. End-for-End Test, Gunner's Quadrant

a. Set both the radial arm and micrometer scale of the gunner's quadrant at zero, making sure the auxiliary indexes match.

b. Place the quadrant on the gunner's longitudinal-leveling plates atop the breech ring, the line-of-fire arrow pointing to the front, and center the quadrant bubble with the elevating mechanism.

c. Reverse the position of the quadrant (turn it end-for-end). If the bubble recenters, the quadrant is in adjustment, and the test is completed.

d. If the bubble does not recenter, try to center it by turning the micrometer knob of the gunner's quadrant. If the bubble centers, read black figures and divide by 2. This is the correction. Place correction on micrometer and place it again on the longitudinal-leveling plates. Relevel the bubble with the elevating mechanism. Check by again reversing the quadrant. Bubble should center.

e. If bubble does not center by turning the micrometer knob as in *d* above, move the radial arm down 1 graduation (10 mils). Turn the micrometer until bubble centers. Take reading on micrometer, add 10 to it, and divide sum by 2. Place this reading on micrometer, leaving the arm at minus 10; level the bubble with the elevating mechanism and check by reversing the quadrant. Bubble should now center.

f. Quadrant should be sent to an ordnance unit if correction of error amounts to more than plus or minus 0.4 mil.

120. Micrometer Test, Gunner's Quadrant

a. Set the radial arm to read 10 mils on the elevation scale and set the micrometer scale at zero.

b. Place the quadrant on the longitudinal-leveling plates atop the breech ring, the line-of-fire arrow pointing to the front, and center the quadrant bubble with the elevating mechanism.

c. Set the radial arm at zero on the elevation scale and turn the micrometer 1 revolution to read 10 mils.

d. Reseat the quadrant on the leveling surface. The bubble should center.

Caution: Do not move the tube after step *c* above.

e. If the bubble does not center, the micrometer is in error and must be adjusted by ordnance personnel.

121. Comparison Test, Gunner's Quadrant

Compare readings taken at low, medium, and high elevations with all of the gunner's quadrants of a battery on the quadrant seats of a *single* gun. The trunnions of this gun should be level. Any quadrant differing from the average by more than 0.4 mil at any elevation should be sent to an ordance unit for adjustment.

122. Correction, Gunner's Quadrant

When a gunner's quadrant requires a correction as determined by the end-for-end test, this correction is not carried during firing but is recorded and is applied only when making sight tests and adjustments.

Section III. TEST OF ELEVATION QUADRANT

123. Cross-Level Bubble Test, Elevation Quadrant

a. With the trunnions level, center the cross-level bubble.

b. Turn the elevation knob throughout its limits of motion.

c. The cross-level bubble should remain centered to within one-half vial graduation; if it does not, the cross-level vial is incorrectly alined. The weapon should be sent to an ordnance unit for adjustment.

124. Mount Alinement Test, Elevation Quadrant

a. Verify that the trunnions are still level.

b. Center the previously tested cross-level bubble.

c. Elevate and depress the tube; at the same time, watch the cross-level bubble.

d. The bubble should remain centered to within one-half vial graduation.

e. If the bubble moves off center in excess of this amount, the elevation quadrant is not properly mounted. Send the weapon to an ordnance unit for adjustment.

125. Pivot Vertical Alinement Test, Elevation Quadrant

a. Center the longitudinal-level bubble.

b. Operate the cross-leveling knob throughout the limits of motion; the longitudinal-level bubble should remain centered.

c. If the bubble moves off center in excess of one-half vial graduation, either the elevation quadrant is improperly mounted or the longitudinal-level vial is not correctly alined. Send the weapon to an ordnance unit for adjustment.

126. Comparison Test, Elevation Quadrant

a. Set low, medium, and high elevations on a gunner's quadrant that has been found to be in correct adjustment. For each elevation, place the quadrant on the leveling plates on the breech and elevate the tube until the bubble is centered.

b. With the elevation knob, center the longitudinal-level bubble for each elevation.

c. Compare the readings set on the gunner's quadrant with those on the elevation quadrant at the low, medium, and high elevations of the tube.

d. If the two instruments do not agree at all elevations, send the weapon to an ordnance unit for adjustment.

Section IV. TESTS FOR TELESCOPE MOUNT M30 AND PANORAMIC TELESCOPE

127. Purpose

The purpose of these tests is to determine whether the azimuth compensating mechanism of the telescope mount actually establishes the tube (regardless of cant) in the correct vertical plane

at all elevations. These tests check the adjustment and mounting of the telescope mount, the setting of the cross-level and longitudinal-level vials, and the alinement of the telescope socket. The test of the telescope mount described in paragraph 128 may be performed with the trunnions either level or canted. It reflects total errors of the entire mechanism. Because compensating errors of various parts of the mount may result in the weapon's testing out properly with this test, the other tests specified in paragraphs 129 through 133 must be performed regardless of the result of test in paragraph 128. Total errors found in this test may then be reduced to errors in specific components.

128. Test of Telescope Mount M30

a. With the boresights in place and tube at a low elevation, traverse so the line of sight through the tube is on the plumb line or transit (par. 85); level the telescope mount by centering both the cross-level and longitudinal-level bubbles.

b. Place the intersection of the cross hairs of the panoramic telescope reticle on any sharply defined aiming point and note the deflection.

c. Elevate the tube from minimum to maximum elevation (or limit of the plumb line) in 100-mil steps. At each step, traverse the weapon (if necessary) to bring the line of sight through the tube back on the plumb line. Relevel the telescope mount in both directions and check for deviation of the line of sight from the aiming point. If the vertical hair is off the aiming point, it is

turned to the aiming point with the azimuth micrometer knob, and the deviation is measured on the azimuth micrometer. If the horizontal hair is off, it is brought to the aiming point with the leveling knobs, and the bubble displacement is noted.

d. If the vertical hair deviates from the aiming point by more than one-half mil from the original deflection at any elevation tested, or if the correction for the deviation of the horizontal hair causes either of the bubbles to travel in excess of one-half vial graduation, the telescope mount is out of adjustment or improperly mounted. The weapon must be referred to authorized ordnance maintenance personnel for adjustment or correction.

129. Cross-Level Test, Telescope Mount and Panoramic Telescope

a. Center the cross-level bubble.

b. Turn the elevation knob throughout its limits of motion.

c. The cross-level bubble should remain centered within one-half vial graduation.

130. Pivot Alinement Test, Telescope Mount and Panoramic Telescope

a. Center the cross-level bubble and place the line of sight of the panoramic telescope on a sharply defined aiming point. (Plumb line may be used.)

b. Elevate the tube to maximum elevation while keeping the telescope mount level longitudinally.

Note. Do not readjust the cross-level bubble after initial setting.

c. Check at low, medium, and high elevation of the tube. The line of sight of the panoramic telescope should not deviate more than 1 mil and the cross-level bubble should remain centered within one-half vial graduation.

131. Verticol Alinement Test of Telescope Mount

a. Relevel the tube using the gunner's quadrant.

b. Center the longitudinal-level bubble.

c. Operate the cross-leveling knob throughout its limits of motion. The longitudinal-level bubble should remain centered within one-half vial graduation.

132. Test for Ponoromic Telescope

a. Zero the scales on the panoramic telescope.

b. Traverse and elevate the tube as necessary to place the panoramic telescope reticle cross hairs on an aiming point.

c. Rotate the telescope head through a complete circle (6,400 mils). The telescope cross hairs should return to the aiming point within 1 mil.

d. Rotate the telescope head through a complete circle in the opposite direction. The telescope cross hairs should again return to the aiming point to within 1 mil.

133. Telescope Mount Socket Alinement Test

a. Center the cross-level bubble.

b. With the panoramic telescope scales set at zero, traverse the tube until the vertical hair of the telescope reticle is on the plumb line, with

both the cross-level and longitudinal-level bubbles centered.

c. Sight through the telescope and rotate the elevation micrometer knob throughout its limits of motion. The vertical hair should remain on the plumb line within 1 mil.

d. Set the panoramic telescope scales at 1,600 mils, and shift the carriage until the vertical hair is on the plumb line with both the cross-level and longitudinal-level bubbles centered.

e. Rotate the telescope elevation micrometer knob throughout its limits of motion. The vertical hair should remain on the plumb line within 1 mil.

Section V. FUZE SETTERS

134. General

a. Examine the stop which fits into the slot in the movable time ring and the adjusting pawl which engages the notch in the fixed fuze ring to see that their edges are not burred or bent. Depress the adjustable pawl against its spring to see that the movement of the pawl is free.

b. In the tests, be sure to test the fuze setter with the fuze for which it is designed; the time scale on the fuze setter must have the same graduations as the time ring on the fuze.

135. Scale Test

Set the corrector, *if applicable,* to 30 and set any convenient time on the time scale. Test the time scale of the fuze setter by setting several fuzes.

136. Precautions

When using live fuzes for performing the test in paragraph 135, the following precautions must be taken:

a. Before setting a fuze, make sure that the "T" and "C" screws of the fuze setter are tight to prevent any slipping of the scale indexes when the handle of the fuze setter is rotated. The time set on the fuze should agree with the time setting on the fuze setter within one-fourth of the smallest graduation on the fuze time ring. The tolerance amounts to 0.05 second for fuzes having 0.2-second graduations and 0.125 second for fuzes having 0.5-second graduations. If the fuzes set do not agree with the time set on the fuze setter, repeat the test as a check with a different setting. If the fuzes set still do not agree with the fuze setter, refer the instrument to an ordnance unit for adjustment.

b. Do not set any one live fuze more than twice. The fuze from a dud must never be used. Reset all fuzes to SAFE and replace the safety wire or cotter pin.

CHAPTER 9

MAINTENANCE AND INSPECTIONS

137. General

Maintenance and inspection are essential to insure that the section is prepared to carry out its mission immediately. Systematic maintenance and inspection drills provide the best insurance against unexpected breakdown at the critical moment when maximum performance is essential.

138. Disassembly, Adjustment, and Assembly

Disassemblies and adjustments of the weapon authorized to be performed by battery personnel are prescribed in TM 9–338-1 and TM 9–8006, supplemented by instructions contained in Department of the Army supply catalogs. No deviation from these procedures is permitted unless authorized by the responsible ordnance officer.

139. Records

a. The principal records pertaining to the weapon are the Artillery Gun Book (OO Form 5825 and/or DA Form 9–13 and DA Form 9–13–1), a field report of accidents (SR 385–310–1), and the Unsatisfactory Equipment Report (DA Form 468). Information on the purpose and use of these records may be found in the records themselves.

b. The chiefs of sections, gun platoon commanders, and battery executive also should keep semipermanent records on their weapons and vehicles for information and guidance.

140. Maintenance

For detailed instructions concerning maintenance of the 280-mm gun T131, 280-mm gun carriage T72, and motor transporter T10, see TM 9–338–1, TM 9–8006, LO 9–338–1, and LO 9–8006.

141. Inspections

Regular inspections are required to insure that materiel is maintained in servicable condition.

a. The chief of section is responsible for the equipment within his section. He should inspect it thoroughly each day. If he sees the need for repair or adjustment, he notifies the gun platoon commander immediately so that the necessary action may be taken.

b. The gun platoon commander, accompanied by the artillery mechanic, should make a daily spot-check inspection. He inspects different parts of the weapons each day to insure complete coverage every few days. At least once a month, the gun platoon commander makes a thorough mechanical inspection of weapons, auxiliary equipment, tools, and spare parts.

c. Battery, battalion, and higher commanders should make frequent command inspections to assure themselves that the equipment in their commands is being maintained at prescribed standards of appearance, condition, and completeness.

Table IV. Maintenance and Inspection Duties

Sequence	Chief of section	Gunner	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Artillery mechanic	Assistant Driver "A"	Assistant Driver "B"	Drivers "A" and "B"	Ammunition corporal
BEFORE OPERATION (MARCH) (B) AND DURING THE HALT (D)														
1	Supervises inspections of members of gun section in all sequences.	(B) Verifies completeness and inspects condition of section chest, assisted by No. 2. (D) Checks security of section chest.	(B)(D) Checks proper positioning and security of cradle travel locks	(B) Assists gunner in checking completeness and condition of section chest.	(B) Inspects firing lock for condition and security.	(B) Verifies presence, condition, and security of sponge, bucket, and sufficient supply of cleaning and preserving material. (D) Assists driver in inspection of section truck.	(B)(D) Checks security of right front carriage transporting lock wedge, fastening key, and key locking pin.	(B)(D) Checks security of right rear carrisge transporting lock wedge, fastening key, and key locking pin.	(B)(D) Assists generator operator or does other duties as designated by the chief of section.	(B)(D) Verifies presence, condition, and security of mechanic's chest, oil pump and chest, and nitrogen tank.	(B)(D) Checks security of left rear carriage transporting lock wedge, fastening key, and key locking pin.	(B)(D) Checks security of left front carriage transporting lock wedge, fastening key, and key locking pin.	(B)(D) Perform inspection and maintenance duties on respective transporters as prescribed by the appropriate TM.	(B)(D) Supervises loading and checking of ammunition and inspection services by ammunition truck drivers.
2	(B)(D) Verifies that gun is properly secured in traveling position and locks are secure.						(B)(D) Checks security of right front lifting fork traveling lock.	(B)(D) Checks security of right rear lifting fork traveling lock.			(B)(D) Checks security of left rear lifting fork traveling lock.	(B)(D) Checks security of left front lifting fork traveling lock.		
3			(B) Inspects condition and security of elevation quadrant and condition of quadrant seats on breech ring.		(B) Checks security of loading trough travel lock and wingnut.		(B)(D) Checks security of right front service and accelerator connections.	(B)(D) Checks security of retracting stop locking pin on right side of carriage.		(B) Inspects oil level in secondary recoil mechanism, draining or filling as necessary.	(B)(D) Checks security of retracting stop locking pin on left side of carriage.	(B)(D) Checks security of left front air hose coupling and air stop cock.		
4	(B) Verifies presence of technical manuals and lubrication orders for gun and transporters, trip ticket, drivers' licenses, accident report forms, and gun book.	(B) Inspects condition and security of sighting and fire control equipment.		(B)(D) Verifies completeness and security of aiming posts, aiming post lights, testing target, and other section equipment except section chest.		(B) Assists No. 2 in checking of section equipment.	(B)(D) Checks security of right mounting ladder locks.	(B)(D) Checks security of right rear service and accelerator connections.			(B)(D) Checks security of left rear air hose coupling and air stop cock.	(B)(D) Checks security of left mounting ladder locks.		
											(B)(D) Checks security of loading davit traveling lock.	(B)(D) Checks security of folding platform bracket latches on left side of carriage.		
5	(B) Checks loading of section equipment for completeness and security.		(D) Checks security of loading trough travel lock and wingnut.				(B)(D) Checks security of folding platform bracket latches on right side of carriage.	(B)(D) Checks security of float travel lock pins.			(B)(D) Checks security of winch cable.	(B)(D) Checks security of generator cable receptacle cover.		
6							(B)(D) Checks security of firing base traveling lock and pin.				(B)(D) Checks security of intercommunication cable connection on left rear of carriage.	(B)(D) Checks security of intercommunication cable connection on left front of carriage.		
7	Reports to battery executive "Sir, No. (so-and-so) in order" or reports any defects which the section cannot remedy without delay.	Reports "Gunner ready."	Reports "No. 1 ready."	Reports "No. 2 ready."	Reports "No. 3 ready."	Reports "No. 4 ready."	Reports "No. 5 ready."	Reports "No. 6 ready."	Reports "No. 7 ready."	Reports "Artillery mechanic ready."	Reports "Assistant driver, "A" unit, ready."	Reports "Assistant driver, "B" unit, ready."	Reports "Driver "A" ("B") unit ready."	Reports to battery executive "Sir, ammunition section in order," or reports anything unusual which the section cannot remedy without delay.

AFTER OPERATION

1	Supervises maintenance and inspection by all members of the gun section in all sequences.	Inspects for presence of all sighting and fire control equipment; cleans and lubricates to the extent authorized.	Inspects condition and security of elevation quadrant, cleans and lubricates to the extent authorized.	Disassemble, clean, and lubricate the breech group to the extent authorized. (Leave disassembled and breech open.)	Obtain sponge, bucket, and cleaning and preserving materials.		Assists No. 4 in cleaning and servicing loading davit.	Assists No. 5 in cleaning and servicing loading trough.	Checks and services primary recoil mechanism.	Assists driver of "A" unit in performing maintenance on "A" unit transporter.	Assists driver of "B" unit in performing maintenance on "B" unit transporter.	Perform maintenance and inspection on respective transporters as prescribed by the appropriate TM, assisted by respective assistant driver.	Supervises maintenance and servicing of machineguns on transporters by ammunition handlers. Supervises performance of maintenance and inspections by drivers of ammunition trucks.
2					Cleans and services loading davit, assisted by No. 6.	Cleans and services loading trough, assisted by No. 7.			Checks and services hydraulic system air filter.				
3													
4		Clean and lubricate tube as directed by the chief of section.											
5		Cleans and lubricates left tube support roller.	Cleans and lubricates right tube support roller.	Reassemble breech group and close breech.	Cleans and lubricates left rear secondary recoil slide and secondary recoil marker.	Cleans and lubricates right rear secondary recoil slide and secondary recoil marker.	Clean and lubricate exposed portion of elevating rack and pinion.		Checks and services equilibrator.				Inspects ammunition components and supervises storage of ammunition by ammunition handlers. Accomplishes turnbacks when applicable.
6		Checks carriage for loose, bent, broken, or missing parts.	Clean and lubricate exposed portion of primary recoil bearing surface of tube and cradle locks.	Cleans and lubricates retracting rails.	Clean and lubricate traversing rack and slides.		Cleans and lubricates left front secondary recoil slide.	Cleans and lubricates right front secondary recoil slide.					
7			Clean and lubricate remainder of carriage as directed by chief of section.				Clean and lubricate turntable and jack assemblies.		Assists chief of section in checking servicing and lubrication of gun and carriage.				
8	Reports to battery executive "Sir, No. (so-and-so) in order" or reports any defects which the section cannot remedy without delay.				Properly store sponge, bucket, and cleaning and preserving materials.								

d. For details on inspecting the 280-mm gun T131 and gun carriage T72, see TM 9–338–1. For details on inspecting the motor transporter T10, see TM 9–8006. Deficiencies found during inspections should be corrected promptly.

e. Duties of individuals in performing the necessary inspections and maintenance of the transporters, gun, and carriage are given in table IV. Work will be made routine, thorough, and rapid by following the drill in table IV. When the section is reduced in strength, the chief of section must reassign duties to insure that all maintenance steps are completed.

142. Duties in Inspection Before Operation (March)

The inspection performed before operation is a final check on materiel prior to leaving the motor park for training in the field or the bivouac area for combat or before displacement. Boresighting is accomplished at this inspection if time permits. After inspection, and when all deficiencies have been corrected, the transporters, gun, and carriage are ready to go into action. For detailed duties of section personnel, see table IV.

143. Duties in Inspection During Operation (March)

The inspections performed during operation are constant checks on the functioning of the transporter and the security of all stowed equipment. The responsibilities and duties of section personnel are as follows:

a. The chief of section rides in the "A" unit transporter, supervises march discipline, and assists the driver in detecting obstacles that would cause injury to personnel or damage to the carriage.

b. The gunner and other numbered cannoneers inspect security of stowed equipment and act as air sentinels as directed by the chief of section.

c. The drivers operate the transporters and inspect all instruments and controls (TM 9–8006).

144. Duties in Inspection During Halt

The inspection at the halt is made to insure that the motor transporters, gun, and carriage are in satisfactory operational condition. The halt provides the section an opportunity to inspect for malfunctions that could not be detected during operation. The duties of the members are listed in table IV.

145. Duties in Inspection and Maintenance after Operation

Immediately after operation the transporters, gun, and carriage are given whatever servicing and maintenance is needed to prepare them for further sustained action or to determine the need for maintenance by higher echelons. These operations may be performed in the motor park, bivouac area, or combat position. Individual duties of gun section personnel are listed in table IV.

146. Duties in Weekly Inspection and Maintenance

In garrison these duties are performed weekly.

On maneuver or in combat they are performed after each field operation.

a. Chief of Section. Supervises section in weekly inspection and maintenance of gun, vehicles, tools, accessories, and equipment. (See TM 9–338–1, TM 9–8006, LO 9–338–1, and LO 9–8006.) He obtains assistance of the artillery mechanic for operations requiring skill and tools beyond the capabilities of the section.

b. Gunner and Cannoneers. Perform normal maintenance as directed by the chief of section.

c. Drivers and Assistant Drivers. Perform normal maintenance in accordance with TM 9–8006 and LO 9–8006. The back of the driver's trip ticket (DD Form 110) will be used as a check list for the weekly maintenance service.

CHAPTER 10

DECONTAMINATION OF EQUIPMENT

147. General

Equipment which has been contaminated by chemical, biological, or radiological agents constitutes a danger to personnel. *Contamination* means the spreading of an injurious agent in any form and by any means. Persons, objects, or terrain may be contaminated. *Decontamination* is the process of making any contaminated place or thing safe for unprotected personnel. This can be done by covering, removing, destroying, or changing into harmless substances the contaminating agent or agents. Generally, only equipment contaminated by persistent agents need be decontaminated.

148. Decontamination for Chemical Agents

a. Ammunition. With rags, wipe off visible contamination from projectiles. Apply DANC (decontamination agent, noncorrossive, M4), wipe with gasoline-soaked rag, then dry. If DANC is not available, scrub with soap and cool water. Slurry (equal weights of water and chloride of lime) can be used on contaminated ammunition containers, but it must not be allowed to penetrate to the ammunition itself.

b. Instruments. If instruments are exposed to corrosive gases, clean them as soon as possible with alcohol (or gasoline, if no alcohol is available), and apply a thin coat of light machine oil. A rag dampened with DANC may be used, followed by drying with a clean rag and then applying a coat of machine oil. DANC injures plastic or hard rubber surfaces.

c. Weapons. Remove dirt, dust, grease, and oil. Do not apply wet mix, but allow surfaces to air after soil and dirt have been removed. DANC can be used on all metal surfaces except the bore. Also effective on metal are hot water, cleaning solvent, or repeated applications of gasoline on swabs. If the emergency use of gasoline-soaked swabs is made (FM 21–40), extreme care must be taken to insure that the gasoline does not spread the contamination and that no gasoline in liquid or vapor form remains. This excess would be ignited when the gun is fired. After decontamination, weapons are dried and oiled.

d. Automotive Equipment. Light contamination from spray can be decontaminated by aeration alone. For heavier contamination, use DANC on interior or exterior surfaces which personnel are likely to touch. For larger area decontamination, wash vehicle with water and scrub painted surfaces with soap and water.

149. Decontamination for Biological and Radiological Agents

a. General. After a contaminating attack, recovery of equipment may be achieved either by

waiting, to permit the decay of contamination, or by active decontamination to reduce danger to a level where it is no longer a significant hazard to operating personnel. Decontamination may be either rough or detailed, depending on the urgency of the military situation. The procedure adopted will be a command decision.

b. Rough Decontamination. Rough decontamination is performed when urgency is the main factor. Its purpose is to reduce contamination sufficiently to permit personnel to work with, or close to, equipment for limited periods. Rough decontamination may be achieved by means of water or steam, if available. Soap or other detergent used in conjunction with water or steam aids in decontamination.

c. Detailed Decontamination. Detailed decontamination, in which the emphasis is on thoroughness, will be carried out in rear areas and repair bases and includes procedures of surface decontamination, aging and sealing, and disposal.

150. References

For further information on decontamination, see FM 21–40, and TM 3–220.

CHAPTER 11

DESTRUCTION OF EQUIPMENT

151. General

a. Tactical situations may arise in which it is necessary to abandon equipment in the combat zone. In such a situation all abandoned equipment must be destroyed to prevent its use by the enemy.

b. The destruction of equipment subject to capture or abandonment in the combat zone will be undertaken only upon authority delegated by a corps or higher commander.

152. Plans

All batteries will prepare plans for destroying their equipment in order to reduce the time required should destruction become necessary. The principles to be followed are—

a. Plans for destruction of equipment must be adequate, uniform and easily carried out in the field.

b. Destruction must be as complete as the available time, equipment, and personnel will permit. Since complete destruction requires considerable time, *priorities* must be established so that the more essential parts are destroyed first.

c. The same essential parts must be destroyed on all like units to prevent the enemy from constructing a complete unit from damaged ones.

d. Spare parts and accessories must be given the same priorities as the parts installed on the equipment.

153. Methods

To destroy equipment adequately and uniformly all personnel of the unit must know the plan and priority of destruction and be trained in the methods of destruction.

154. References

For detailed information on destruction of the gun, carriage, and fire control equipment, see TM 9–338–1; for destruction of ammunition, see TM 9–1901; for destruction of the T10 transporters, see TM 9–8006.

CHAPTER 12

SAFETY PRECAUTIONS

155. General

Safety precautions to be observed in training are prescribed in SR 385–310–1. Additional information is found in FM 6–140, TM 9–338–1, TM 9–1900, and TM 9–1901. The more important safety precautions are summarized in the following paragraphs.

156. Ammunition

a. All ammunition on the ground at the firing position must be so placed that it is protected against explosion in case of accident at the position. Flames and explosive materials such as gasoline must be kept away from ammunition. Ammunition should be protected from direct rays of the sun by use of a tarpaulin or other suitable covering.

b. Battery personnel must not attempt to disassemble fuzes or remove primers from rounds.

c. If for any reason a round is not fired after the time fuze has been set, the fuze must be reset to SAFE before it is restowed.

d. All rounds not fired which have been prepared for firing must be checked by the chief of section to insure that all powder increments are

present in proper order and condition, and that they are of the proper lot number. He also verifies that the lot number on the ammunition corresponds to the lot number on the container. When ammunition is to be returned to ordnance, a battery officer must certify that it has been properly reassembled. (For further details, see FM 6–140.)

157. Misfires

A misfire is a complete failure to fire, whereas a hangfire is a *delay* in the functioning of the propelling charge explosive train. These facts have the following significance: Since a misfire could possibly be a hangfire, it is extremely dangerous to mount the carriage until 10 minutes after all offcarriage attempts to fire have been made. After this time lapse, spin the firing lock and remove the primer. Only one man will mount the carriage. For detailed procedure in the event of misfire, refer to TM 9–338–1.

158. General Safety Precautions During Drill and Firing

a. The gun is kept unloaded except when firing is imminent.

b. Members of the section on the ground pass in rear of the carriage when going from one side to another.

c. Personnel should stay well away from the gun to prevent injury when the gun recoils.

d. During firing personnel should use waste in their ears to protect eardrums against injury.

159. Specific Safety Precautions During Drill and Firing

The extremely heavy weight of the gun and its components, coupled with the desire of personnel to develop speed, presents a formidable safety problem. To avoid injury to personnel and damage to equipment, extreme vigilance on the part of personnel conducting training must be exercised. No unsafe practices can be tolerated. Three operations which are potentially dangerous are—

a. Lowering the gun to the ground.

b. Winching the tube into and out of battery.

c. Raising the gun to traveling position.

Caution: No operation should be hurried at the expense of safety.

160. Safety Officer

In training, there must always be a safety officer for each artillery unit firing. For duties of safety officer, see FM 6–40.

CHAPTER 13

TRAINING

Section I. GENERAL

161. Purpose and Scope

The purpose of this chapter is to present the absolute minimum requirements for training the personnel of a gun section in the performance of their duties in service of the gun. It includes general information on the conduct of training, a minimum training schedule, and tests to be given for the qualification of gunners.

162. Objectives

The objectives are speed in training cannoneers in their individual duties; and, through drill, to weld them into an effective, coordinated team able to function efficiently in combat. During training, supervisors may well keep in mind the proficiency sought by the Army Training Test for the 280-mm Gun Battalion. Maximum efficiency is attained through continuous drills.

163. Conduct of Training

a. Training will be conducted in accordance with the principles laid down in FM 21–5. Its goal should be the standards set forth in FM 6–125, SR 615–25–15, and SR 615–25–20.

b. In general, individual training is conducted

by noncommissioned officers as far as practicable. Officers are responsible for preparing training plans, for conducting unit training, and for supervising and testing individual training.

c. Throughout training, the application of prior instruction to current training must be emphasized.

d. A record of the training received by each individual should be kept. This may be done by each chief of section keeping a progress card for each man in his section. This card should show each period of instruction attended, tests taken, and remarks pertaining to progress. Progress cards should be inspected frequently by the battery executive to make sure that they are being kept properly and to determine the state of training. *Requiring the chief of section to keep these records emphasizes his responsibility toward his section.*

e. The necessity for developing leadership and initiative in noncommissioned officers must be emphasized constantly throughout training.

164. Standards To Be Attained

A satisfactorily trained gun section must know the duties of all other members of the section and be able to perform efficiently in all positions. See chapter 14 for tests to be given for the qualification of gunners.

Section II. MINIMUM TRAINING SCHEDULE

165. General

The training schedule given in paragraph 167 is a guide to meet the minimum training require-

ments of personnel of a gun section in subjects covered in this manual.

166. Individual Periods

a. Individual periods of training in service of the gun should be arranged, along with other battery training, into a balanced training program, taking into consideration the basic principles of training.

b. In general, except for service practice, periods on any subject should not be longer than 1 hour. Gun drill periods should be for one-half hour only and should be conducted in a vigorous manner.

c. Periods of gun drills should be preceded and followed by periods on subjects that will be logically related to the drill. For example, precede a period of gun drill with a period of testing and adjustment of sighting and fire control equipment, and follow it with a period on inspection and maintenance drills. A period on aiming post displacement correction may come between two periods of gun drill.

d. TM 9–338–1 provides information on which to base periods of instruction on description, characteristics, and functioning of the gun; familiarization with the gun, including breech and firing mechanism, tube assembly and top carriage, recoil mechanism, equilibrator, elevating mechanism, and sighting and fire control equipment; and field assembly and malfunction. These should be included in the battery training schedule, closely allied with the training in service of

the gun given in paragraph 167. Approximately 8 hours should be devoted to this instruction.

e. Additional service of the gun training may be performed during battery training exercises.

167. Schedule

C—conference; D—demonstration; PW—practical work.

Method	Hours	Subject	Text references	Training aids and equipment
C, D, PW	1	Organization and composition of gun section; general duties of individuals; formation of gun section.	Pars. 5–9	Weapon and section vehicles.
C, D, PW	1	Posts and posting of cannoneers; changing posts; mounting and dismounting.	Pars. 10–14, 78	Do.
C, D, PW	20 (2-hour periods)	Prepare for action and march order.	Pars. 15–18, 73–75, 77–81, 84.	T/O&E equipment.
C, D, PW	24 (½-hour periods)	Gun drill, duties in firing	Pars. 19–74, 76, 78, 80, 83, 86–90, 92–94.	Do.

C, D, PW	6 (1-hour and ½-hour periods)	Testing and adjustment of sighting and fire control equipment.	Pars. 95–136, 85	Do.
C, D, PW	1 (½-hour periods)	Aiming post displacement correction.	Pars. 86–89	T/O&E equipment, blackboard, and chalk.
C, D, PW	4 (1-hour periods)	Inspection and maintenance drills.	Pars. 137–146, 82	T/O&E equipment.
C, D, PW	1	Decontamination of materiel.	Pars. 147–150	Decontamination equipment; T/O&E equipment.
C, D, PW	1	Destruction of materiel to prevent use by the enemy	Pars. 151–154	Demolition and T/O&E equipment.
C, D	1	Safety precautions	Pars. 155–160	T/O&E equipment.

Method	Hours	Subject	Text references	Training aids and equipment
PW	16 (4-hour periods)	Service practice	Pars. 19–74	Do.
C, PW	6 (1-hour periods)	Review and tests of subjects previously covered.	All previous references	Do.

CHAPTER 14

TESTS FOR QUALIFICATION OF GUNNERS

Section I. GENERAL

168. Purpose and Scope

This section prescribes the tests to be given in the qualification of gunners. The purpose of the tests is twofold:

a. To provide a means of determining the relative proficiency of the individual artillery soldier in the performance of the duties of the gunner, 280-mm gun. *The tests will not be a basis for determining the relative proficiency of batteries or higher units.*

b. To serve as an adjunct to training.

169. Standards of Precision

The candidate will be required to perform the tests in accordance with the standards listed below.

a. Scale settings must be exact, and matching indexes must be brought into coincidence.

b. Level bubbles must be exactly centered.

c. The vertical hair in the reticle of the panoramic telescope must be alined on the left edge of the aiming post or on exactly the same part of the aiming point each time the gun is laid.

d. Final motions of azimuth and elevation setting knobs, as well as traversing and elevating handwheels, must be made in the appropriate direction. For elevating, the final motion of the handwheel should be in the direction of the more difficult movement. Final motion for traversing is from left to right. Final movement of the vertical hair of the telescope is from left to right.

170. Assistance

The candidate will receive no unauthorized assistance. Each candidate may select authorized assistants as indicated in the tests. In the event a candidate fails any test through the fault of the examiner or any assistant, the test will be disregarded, and the candidate will be given another test of the same nature.

171. Time

The time for any test will be the time from the last word of the command to the last word of the candidate's report. The candidate may begin any test after the first word of the first command.

172. Scoring

Scoring will be conducted in accordance with the two paragraphs, *Penalties* and *Credit,* under each subject. If a test is performed correctly, credit will be given in accordance with paragraph 185. No credit will be allowed if conditions exist as specified in paragraph 184.

173. Preparation for Tests

The gun will be prepared for action and the candidate posted at the proper position corre-

sponding to the test being conducted or as indicated in paragraph 187. The examiner will insure that the candidate understands the requirements of each test and will require the candidate to report "I am ready," before each test.

174. Qualification Scores

Minimum scores required for qualification in the courses are as follows:

Individual Classification	*Points*
Expert gunner	90
First-class gunner	80
Second-class gunner	70

175. Outline of Tests

Section No.	Subject	Number of tests	Points each	Maximum credit
II	Indirect laying, deflection only	18	2	36
III	Displacement correction	2		6
	Part I	(1)	4	(4)
	Part II	(1)	2	(2)
IV	Measuring deflection	2	3	6
V	Laying for elevation with elevation quadrant	3	2	6
VI	Laying for elevation with gunner's quadrant	3	3	9
VII	Measuring site to the mask	1	6	6
VIII	Measuring elevation	1	5	5
IX	Tests and adjustment of sighting and fire control equipment	5		10
	Tests 1 and 5	(2)	3	(6)
	Tests 2 and 4	(2)	1	(2)
	Test 3	(1)	2	(2)
X	Materiel	3		16
	Tests 1 and 2	(2)	3	(6)
	Test 3	(1)	10	(10)
	Total credit			100

Section II. TEST, INDIRECT LAYING, DEFLECTION ONLY

176. Scope of Tests

Eighteen tests will be conducted in which the candidate will be required to execute commands similar to those given below. Tests 1 through 4 (and tests 5 through 9, 10 through 13, and 14 through 18) will be executed as one series of commands.

177. Special Instructions

a. Commands will not necessitate manual shifting of the gun (beyond the limits of the traversing rack).

b. The examiner will select a suitable aiming point and identify it to the candidate.

c. Commands for special corrections will be given *only* in the tests indicated in the examples below.

d. The command for new deflections for each test will be within the folowing prescribed limits:

Test number	Maximum change (mils)	Minimum change (mils)
2 and 11	40	30
3 and 12	20	15
4 and 13	10	5
7 and 16	20	12
8 and 17	10	5
9 and 18	5	3

e. The gun will be laid with correct settings at the conclusion of each test before proceeding with the next test.

f. Aiming posts will be set out at prescribed deflection and distances for these tests.

g. The examiner will designate the gun platoon to be used. The examiner will announce special corrections in deflection to be applied by the candidate.

178. Outline of Test

Test Number	Examiner commands (for example)	Action of candidate
1 and 10	SPECIAL CORRECTIONS, DEFLECTION 2220, NO. 1 LEFT 4.	Sets deflection and applies special correction. Centers cross- and longitudinal-level bubbles. Traverses gun until vertical hair is on left edge of aiming posts. Checks centering of bubbles. Re-lays if necessary. Calls "Ready" and steps clear.
2 and 11	DEFLECTION 2185	Sets deflection change. Leaves correction on gunner's aid. Lays on aiming posts. Checks centering of bubbles. Re-lays if necessary. Calls "Ready" and steps clear.
3 and 12	DEFLECTION 2203	Same as test 2 above.
4 and 13	NO. 1, RIGHT 7	Same as test 2 above, but changes gunner's aid to right 7 and resets deflection 2207 opposite index.

Test Number	Examiner commands (for example)	Action of candidate
	At conclusion of test 4 (13) give END OF MISSION. (No time considered for this operation)	Gunner moves gunner's aid to zero. Resets deflection to 2200 and relays on aiming posts.
5 and 14	AIMING POINT, CHURCH STEEPLE, REFER.	Refers telescope to church steeple. Reads deflection and calls "No. 1, deflection (so much)."
6 and 15	DEFLECTION 2200, REFER ----------	Slips the slipping azimuth micrometer scale to zero. Slips the slipping azimuth scale to 2200. Verifies that vertical reticle is on church steeple. Calls "No. 1, deflection 2200." Steps clear.
7 and 16	SPECIAL CORRECTIONS, DEFLECTION 2213, NO. 1, LEFT 4.	Same as test 1 above.
8 and 17	DEFLECTION 2222	Same as test 2 above.
9 and 18	DEFLECTION 2217	Same as test 2 above.

179. Penalties

a. No credit will be allowed if after each test—

(1) The deflection is set incorrectly.

(2) The cross-level or longitudinal-level bubble is not centered.

(3) The vertical hair of the telescope is not on the aiming point or left edge of aiming posts, as the case may be.

b. No credit will be allowed if the last motion of the traverse was not made to the right.

180. Credit

Time in seconds, exactly or less than—			
Tests 1, 10, 6, and 15 each	12	13	14
Other tests, each	8	9	10
Credit	2.0	1.5	1.0

Section III. TEST FOR DISPLACEMENT CORRECTION

181. Scope of Test

One test, consisting of two parts, will be conducted in which the candidate will be required to execute the commands given below.

182. Special Instructions

a. Aiming posts will be set out at the prescribed distances.

b. An assistant, selected by the candidate, will be stationed close to the far aiming post.

c. The examiner will require the candidate to lay the gun on an announced deflection and report, "I am ready."

d. The far post or the gun will then be moved so that a displacement of 5 to 10 mils occurs.

e. The laying of the gun at the termination of part I will not be disturbed for part II.

183. Outline of Test

a. Part I.

Examiner commands	Action of candidate
CORRECT FOR DISPLACEMENT	Lays the gun so that the far post appears midway between the near post and the vertical cross hair of the telescope. Checks centering of bubbles. Re-lays if necessary. Calls "Ready" and steps clear.

b. Part II.

Examiner commands	Action of candidate
ALINE AIMING POSTS	Records deflection on breech and announces "Deflection (so much) recorded." Directs assistant in alining aiming posts. Calls "Ready" and steps clear.

184. Penalties

No credit will be allowed for either part if—

a. Part I.

(1) The far aiming post does not appear midway between the near post and the vertical cross hair of the telescope.

(2) The cross-level or longitudinal-level bubble is not centered.

(3) The last motion of traverse was not made to the right.

b. Part II.

(1) The deflection is other than the announced deflection.

(2) The aiming posts are not properly alined.

(3) The vertical hair of the telescope is not on the aiming posts.

185. Credit

Part I. time in seconds, exactly or less than	3	3-1/3	3-2/3	4
Credit	4.0	3.0	2.0	1.0
Part II, no time limit—				
Credit	2.0	—	—	—

Section IV. TEST FOR MEASURING DEFLECTION

186. Scope of Test

Two tests will be conducted in which the candidate will be required to measure and report a deflection in accordance with the commands given below.

187. Special Instructions

a. The gun will be laid on aiming posts to the left front.

b. The examiner will select two aiming points: the aiming point for test 1 to be within 130 mils to the left or right of the aiming posts, and the second point to be within 130 mils on the opposite side of the aiming posts.

c. The appropriate aiming point will be designated by the examiner and identified by the candidate prior to the start of each test.

188. Outline of Test

Test Number	Examiner commands (for example)	Action of candidate
1	NUMBER 1, AIMING POINT, CHURCH STEEPLE TO LEFT FRONT, REFER.	Centers cross-level and longitudinal-level bubbles. Refers to aiming point. Checks centering of bubbles and re-lays telescope if necessary. Reads deflection and reports, "No. (so-and-so) deflection (so much)" and steps clear.
2	NUMBER 1, AIMING POINT, LONE TREE ON SKYLINE, LEFT FRONT, REFER.	Same as test 1 above.

189. Penalties

No credit will be allowed if—

a. The cross-level or longitudinal-level bubble is not centered properly.

b. The vertical hair of the telescope is not on the aiming point.

c. The deflection is announced incorrectly.

d. The traversing handwheel is turned.

190. Credit

Time in seconds, for each test, exactly or less than	5	5-3/5	6	6-3/5
Credit	3	2	1.5	1

Section V. TEST FOR LAYING FOR ELEVATION WITH ELEVATION QUADRANT

191. Scope of Test

Three tests will be conducted in which the candidate will be required to execute commands similar to those given below.

192. Special Instructions

a. Each test will require a change of settings and the accompanying laying of the tube in elevation. (All commands given will be within the limits of 200 to 400 mils on the elevation quadrant scale.)

b. Commands for elevation for tests 2 and 3 will not be made in multiples of 5 mils.

c. The candidate will be posted as No. 1 cannoneer.

d. The starting elevation for each test will be the loading elevation (215 mils).

193. Outline of Test

Test Number	Examiner commands (for example)	Action of candidate
1	ELEVATION 280___	Sets announced quadrant. Centers cross-level and longitudinal-level bubbles. Calls "Set" and steps clear.
2	ELEVATION 316___	Same as test 1 above.
3	ELEVATION 323___	Same as test 1 above.

194. Penalties

a. No credit will be allowed if after each test—

(1) The quadrant is not set accurately.

(2) The cross-level or longitudinal-level bubble is not centered.

b. No credit will be allowed if the last movement of the tube was not in the direction in which it is most difficult to turn the elevating handwheel.

195. Credit

Time in seconds, for each test, exactly or less than	6-3/5	7-3/5	8-3/5
Credit	2.0	1.5	1.0

Section VI. TEST FOR LAYING FOR ELEVATION WITH GUNNER'S QUADRANT

196. Scope of Tests

Three tests will be conducted in which the candidate will be required to execute commands similar to those given below.

197. Special Instructions

a. The gunner's quadrant will be set at zero for the first test.

b. Each succeeding test will require a change of quadrant setting within the limits of 30 to 60 mils.

c. The candidate will be posted to the right of and facing the breech, with the gunner's quadrant in his hand.

d. An assistant, selected by the candidate, will be posted to operate the elevating handwheel.

198. Outline of Test

Test Number	Examiner commands (for example)	Action of candidate
1	QUADRANT 286	Sets quadrant command on gunner's quadrant. Seats quadrant. Has assistant elevate or depress the tube until the quadrant is centered. Calls "Ready" and waits for examiner to verify laying.
2	QUADRANT 242	Same as test 1 above.
3	QUADRANT 273	Same as test 1 above.

199. Penalties

No credit will be allowed if, after each test—

a. The quadrant is set incorrectly.

b. The quadrant is not properly seated.

c. The quadrant bubble is not properly centered.

200. Credit

Time in seconds, for each test, exactly or less than	6	6-3/5	7
Credit	3.0	2.0	1.0

Section VII. TEST FOR MEASURING SITE TO MASK

201. Scope of Test

One test will be conducted in which the candidate will be required to execute the command given below.

202. Special Instructions

a. The gun, prepared for action, will be placed 200 to 400 yards from a mask of reasonable height.

b. The tube will be pointed so that it is 15 to 20 mils above the crest and 15 to 20 mils right or left of the highest point of the crest.

c. The candidate will take post at the rear of the breech.

d. Assistants selected by the candidate will be posted as required to operate the elevating and traversing mechanisms.

203. Outline of Test

Examiner commands	Action of candidate
MEASURE SITE TO MASK	Sights along lowest element of bore and directs operation of the elevating and traversing mechanism until line of sight just clears crest. Takes position of number 1, centers longitudinal-level bubble by turning elevating knob, and centers cross-level bubble. Reads elevation from the elevation quadrant scale and micrometer. Reports "No. (so-and-so), site to mask (so much)."

204. Penalties

No credit will be allowed if—

a. The line of sight along the lowest element of the bore does not just clear crest.

b. The cross-level or longitudinal-level bubble is not properly centered.

c. The site is announced incorrectly.

d. The last movement of the tube was not in the direction in which it is most difficult to turn the elevating handwheel.

205. Credit

Time in seconds, exactly or less than	15	16	17	18
Credit	6.0	4.5	3.0	1.5

Section VIII. TEST FOR MEASURING ELEVATION

206. Scope of Test

One test will be conducted in which the candidate will be required to measure the elevation by means of the gunner's quadrant.

207. Special Instructions

Prior to the test the examiner will lay the tube at a selected elevation, measure the elevation, and then set the gunner's quadrant at zero.

208. Outline of Test

Examiner commands	Action of candidate
MEASURE THE ELEVATION	Places gunner's quadrant on quadrant seats of the breech ring. Levels bubble by raising or lowering the index arm and turning the micrometer knob. Announces "No. (so-and-so), elevation (so much)," and hands quadrant to examiner.

209. Penalties

No credit will be allowed if—

a. The quadrant bubble is not centered when the quadrant is seated properly.

b. The elevation is announced incorrectly.

210. Credit

Time in seconds, exactly or less than	8	9 2/5	10 3/5
Credit	5.0	3.5	2.0

Section IX. TEST AND ADJUSTMENT OF SIGHTING AND FIRE CONTROL EQUIPMENT

211. Scope of Test

Five tests will be conducted in which the candidate will be required to demonstrate the methods employed in making the prescribed tests and authorized adjustments, or describe the action to be taken (e.g., send to ordnance) if adjustment is not authorized to be made by using personnel.

212. Special Instructions

a. The gun will be prepared for the tests by having the trunnions leveled and the tube in center of traverse. Cross hairs will be installed on the muzzle and either the breech boresight inserted or the firing mechanism removed.

b. The following equipment will be required: cross hairs for the muzzle (breech boresight optional), gunner's quadrant, plumb line or transit, test target, and suitable screwdrivers and wrenches.

c. The candidate will select assistants who will operate the elevating handwheel and adjust and aline the testing target at the direction of the candidate.

d. The tests will be conducted in the chronological sequence indicated in paragraph 213. After completion of test 2, the gunner's quadrant used in tests 1 and 2 will be used for test 3, with the proper correction, as determined in test 1, carried on the quadrant, provided the correction does not exceed 0.4 mil.

e. Adjustments which the candidate may be required to accomplish will fall within the following limits:

(1) Elevation micrometer scales not to exceed ten 1-mil graduations.

(2) Panoramic telescope slipping azimuth micrometer scale, not to exceed ten 1-mil graduations.

f. The tube will be leveled at the conclusion of test 2 and will not be disturbed thereafter.

213. Outline of Test

Test Number	Examiner commands	Action of candidate
1	PERFORM END-FOR-END TEST ON GUNNER'S QUADRANT.	Performs test as prescribed in paragraph 119 of this manual. Calls "Error (so many) mils, quadrant serviceable (unserviceable)" and hands quadrant to examiner for verification.

Test Number	Examiner commands (for example)	Action of candidate
2	PERFORM MICROMETER TEST ON GUNNER'S QUADRANT.	Performs test as prescribed in paragraph 120 of this manual. Calls "Quadrant micrometer is (is not) in error."
3	TEST TELESCOPE MOUNT	Performs test and makes adjustments, if necessary, as prescribed in paragraphs 128 through 133 of this manual. Calls "Cross- (longitudinal) level bubble(s) within (without) allowable limit." ***Caution:*** Do not turn cross-leveling or elevation knobs of the telescope mount after this test.
4	TEST ELEVATION QUADRANT	Performs test and makes adjustments, if necessary, as prescribed in paragraphs 123 through 126 of this manual. Calls "Ready" and steps clear. *Note.* Prior to test 5, the cross- and longitudinal-leveling of the tube and the panoramic telescope mount will be verified by the examiner, and the testing target will be alined by the candidate with the help of the selected assistant.
5	TEST ADJUSTMENT OF PANORAMIC TELESCOPE.	Performs tests and makes adjustments as described in paragraphs 100 and 101 of this manual. Calls "Ready" and steps clear.

214. Penalties

The tests are not essentialy speed tests. The purpose of the prescribed time limits is to insure that the candidate can perform the operation without wasted effort. No credit will be allowed for tests 1 through 5 if—

a. Test 1.

(1) The bubble of the gunner's quadrant does not center when verified by the examiner.

(2) The error (one-half of the amount of the angle which was indicated when the quadrant was first reversed and the bubble centered by moving the index arm and micrometer) is announced incorrectly by the candidate.

(3) The candidate fails to declare the quadrant unserviceable if the error (necessary correction) exceeds 0.4 mil, or fails to declare the quadrant serviceable if the error (necessary correction) is 0.4 mil or less.

(4) The time to complete the test exceeds 2 minutes.

b. Test 2.

(1) The procedure is not followed correctly.

(2) The time to complete the test exceeds 1 minute.

c. Test 3.

(1) The bubble of the gunner's quadrant is not centered in both directions.

(2) The candidate does not announce correctly in regard to the status of either

the cross-level or longitudinal-level bubble.

(3) The time to complete the test and adjustments exceeds 4 minutes.

d. Test 4.

(1) The elevation micrometer does not read zero when the elevation scale reads zero.

(2) The cross-level or longitudinal-level bubble is not properly centered.

(3) The time to complete the tests and adjustments exceeds 2 minutes.

e. Test 5.

(1) The candidate fails to make any adjustment when such adjustment is indicated.

(2) The rotating head elevation micrometer indexes are not in coincidence.

(3) The zero line of either the azimuth scale or azimuth scale micrometer is not in coincidence with its respective index.

(4) The center line of the bore, as viewed through the boresights, or the line of sight of the telescope do not fall on their respective sighting points on the testing target when all scales are set at zero.

(5) The time to complete the tests and adjustments exceeds 4 minutes and 30 seconds.

215 Credit

a. The candidate will be scored on the general merit of his work in addition to the specific requirements above.

b. If the tests and adjustments are performed correctly within the prescribed time limit, maximum credit will be given as follows:

Test 1	3
Test 2	1
Test 3	2
Test 4	1
Test 5	3
Total	10

Section X. TEST FOR MATERIEL

216. Scope of Tests

The candidate will be required to perform three tests as prescribed below.

217. Special Instructions

a. Tests 1 and 2. For tests 1 and 2, a paulin will be placed on the carriage for the convenience of the candidate in laying out the disassembled parts. The candidate will be allowed to select the tools and accessories necessary for the performance of the tests prior to the start of the tests.

b. Test 3. A complete set of lubrication equipment authorized for use of battery personnel will be made conveniently available on a paulin adjacent to the gun. Every type of lubricant used on the gun will be placed conveniently on the paulin, each in a plainly labeled container and the lubrication order for the gun will be made available for use of the candidate.

218. Outline of Tests

Test Number	Examiner commands	Action of candidate
1	PERFORM AUTHORIZED DISASSEMBLY OF FIRING LOCK.	Performs the operation as described in the appropriate TM, laying the parts on the paulin. After disassembly, identifies all disassembled parts to examiner.
2	ASSEMBLE COMPONENTS OF FIRING LOCK.	Performs the operation as described in the appropriate TM.
3	DAILY, WEEKLY, AND MONTHLY LUBRICATION TEST.	Using the lubrication order as a guide, selects proper lubricating equipment and lubricant and shows *how* and with *which lubricant* each lubrication point is serviced. (Actual lubrication is not performed.)

219. Penalties

a. The tests are not essentially speed tests. The purpose of the maximum time limits is to insure that the candidate can perform the operations without wasted effort.

b. No credit will be given if the following time limits are exceeded:

Test 1 ..... 1 minute
Test 2 ..... 2 minutes
Test 3 ..... 10 minutes

c. A penalty of one-half point will be assessed for each component part not correctly identified or for each part omitted in test 1. There is no

time limit imposed on the identification of component parts. However, the examiner may reduce the grade if it becomes obvious that the candidate is not familiar with the nomenclature.

220. Credit

a. The candidate will be scored on the general merit of his work, in addition to the specific requirements above.

b. If each test is performed correctly within the prescribed time limit, maximum credit will be given as follows:

Test 1	3
Test 2	3
Test 3	10
Total	16

APPENDIX
REFERENCES

1. Miscellaneous Publications

AR 600–70	Badges
AR 750–5	Maintenance Responsibilities and Shop Operation.
ATP 6–300	Army Training Program for Field Artillery Unit.
SR 110–1–1	Index of Army Motion Pictures, Kinescope Recordings, and Film Strips (Supplement No. 3).
SR 310–20 series	Military Publications.
SR 320–5–1	Dictionary of United States Army Terms.
SR 320–50–1	Authorized Abbreviations.
SR 385–310–1	Regulations for Firing Ammunition for Training, Target Practice, and Combat.
SR 615–25–15	Military Occupational Specialties.
SR 615–25–20	Career Fields.
SR 700–45–5	Unsatisfactory Equipment Report.
T/O&E 6–537A	Field Artillery Battery, 280-mm Gun.

FM 5–15	Field Fortifications.
FM 5–20	Camoflage, Basic Principles.
FM 5–20B	Camouflage of Vehicles.
FM 5–20D	Camouflage of Field Artillery.
FM 5–25	Explosives and Demolitions.
FM 6–40	Field Artillery Gunnery.
FM 6–101	The Field Artillery Battalion.
FM 6–125	Qualification Tests for Specialists, Field Artillery.
FM 6–140	The Field Artillery Battery.
FM 21–5	Military Training.
FM 21–8	Military Training Aids.
FM 21–30	Military Symbols.
FM 21–40	Defense Against Chemical Attack.
FM 21–60	Visual Signals.
FM 22–5	Drill and Ceremonies.
FM 23–65	Browning Machine Gun, Cal. .50, HB, M2.
FM 25–10	Motor Transportation, Operations.
TM 3–220	Decontamination.
TM 5–5006	Generator Set, Electric, Portable Gasoline Driven, Skid-Mounted, Liquid Cooled, Fermont Model, M30GCT–SH6.

Field Artillery Individual and Unit Training Standards.	TM 6–605	
	TM 9–338–1	280-mm Gun T131 and 280-mm Gun Carriage T72.
	TM 9–575	Auxiliary Sighting and Fire Control Equipment.
	TM 9–8006	4x4 Heavy Gun-Lifting Front Truck M249 and 4x4 Heavy Gun-Lifting Rear Truck M250.
	TM 9–850	Abrasive, Cleaning, Preserving, Sealing, Adhesive, and Related Materials Issued for Ordnance Materiel.
	TM 9–1527	Gunner's Quadrants M1 and M1918, and Machine Gun Clinometer M1917.
	TM 9–1590	Fuze Setters, M14, M22, M23, M25, and M27.
	TM 9–1900	Ammunition, General.
	TM 9–1901	Artillery Ammunition.
	TM 9–2300	Artillery Materiel and Associated Equipment.
	TM 9–2853	Preparation of Ordnance Materiel for Deep Water Fording.
	TM 9–6111	Ordnance Maintenance: Panoramic Telescopes, M1, M12, M12A2, M12A5, and M12A6.

TM 9–2810	Tactical Motor Vehicle Inspection and Preventive Maintenance Services.
TM 21–300	Driver Selection and Training.
TM 21–305	Driver's Manual.

2. DA ORD Supply Manuals

SNL D–57	Gun, 280-mm, T131, Carriage, Gun, 280-mm, T72.
SNL K–1	Cleaning and Preserving Materials.
SNL P–1	Projectiles for Heavy Artillery.
SNL P–2	Charges, Propelling.
SNL P–6	Subcaliber Ammunition.
SNL P–7	Fuzes and Primers.
SNL P–8	Ammunition Instruction Material.
SNL R–7	Demolition Materiel, Land Mines, and Fuzes.

3. DA Forms

DA Form 468	Unsatisfactory Equipment Report.
DD Form 110	Vehicle and Equipment Operational Record.

INDEX

	Paragraphs	Page
"A" unit (definition)	2	4
Accuracy tests for telescope mount M30	127–133	131
Action, to prepare	16	22
Adjustment, assembly, disassembly of the weapon	138	137
Adjustment of sighting and fire control equipment	95–114	99
Qualification tests	211–215	172
To verify	34	55
Agents, procedures for decontaminating:		
Biological	149	143
Chemical	148	142
Radiological	149	143
Aiming circle method, boresighting	105–110	105
Aiming point:		
To indicate to the gunner	23	50
To set a common deflection	45	66
Aiming point, distant	87	86
Method of boresighting	103–104	104
Aiming points and displacement corrections	47	67
Aiming posts:		
Correction for displacement	47	67
Qualification tests	181–185	163
Lights	88	86
To aline	44	64
To set out	16	22
Ammunition: (*See also* Projectile)		
Care	93	96
Decontamination, chemical agents	148	142
Safety precautions	156	147

	Paragraphs	Page
Ammunition corporal, duties in firing	19	43
Anchors, turntable	79	78
Angle, standard method of boresighting	111–114	117
Artillery mechanic, duties in firing	19	43
Assembly, disassembly, adjustment of weapon	138	137
Assign duties with reduced personnel	32	53
Attach the lanyard	19, 60	43, 72
"B" unit (definition)	2	4
Basic data, to record	29	52
Basic periodic tests	115–136	125
Accuracy tests for telescope mount M30	127–133	131
Fuze setters	134–136	135
General	115–117	125
Ordnance check	115	125
Test:		
Elevation quadrant	123–126	130
Gunner's quadrant	118–122	127
Biological agents, procedures in decontaminating	149	143
Board, section data	94	98
Bore:		
Cleaning:		
After firing	82, 145	80, 140
Before firing	16	22
Clear	16, 57	22, 71
To swab	16	22
Boresighting	95–114	99
Aiming circle method	105–110	105
Distant aiming point method	103–104	104
Elevation quadrant	102	103
Equipment	96	99
Standard angle method	111–113	117
Testing target method	99–102	101

	Paragraphs	Page
Boresight(s):		
Equipment	96	99
Marks	107	107
Box, receptacle	77	78
Brake, elevating	51	68
Breech recess, to clean	56	71
Call off	9	13
Cannoneers (*See also* No.)	6	10
Care and maintenance	137–146	137
Care of ammunition	93	96
Carriage:		
Decontamination	148	142
Maintenance and inspections:		
After operation	145	140
Before operation	142	139
During halt	144	140
During operation	143	139
Weekly	146	140
Shift, to make:		
Large	90	90
Slightly in excess of traverse limits	90	90
Small	90	90
To arrest movement	79	78
Cease firing	92	95
Change:		
A deflection, to	38	56
Posts	11	18
Changing direction	36, 90	55, 90
Charges:		
Care of	93	96
To place in chamber	54	69
To prepare	19	43
Check, ordnance	115	125
Chemical agents, decontamination procedures	148	142
Chief of section, duties:		
General	6	10

	Paragraphs	Page
Chief of Section, duties—Continued		
In firing	21	49
In inspection and maintenance	141–146	138
Circle, aiming, method of bore-sighting	105–110	105
Classification, individual, gunner's qualification tests	174	159
Command:		
Fire, to follow	24	50
To fire	26	51
Commands and formations, preliminary	9–14	13
Common aiming point, to set a deflection on	45	66
Comparison test:		
Elevation quadrant	126	131
Gunner's quadrant	121	129
Composition, gun section	5	10
Corporal, ammunition. (*See* ammunition corporal.)		
Correction (s):		
Gunner's quadrant	122	130
Mistakes	27	51
Correction, displacement:		
For aiming posts	47, 89	67, 88
Qualification tests	181–185	163
Correction, special, to apply for deflection	46	66
Corrector	135	135
Data:		
Basic, to record	29	52
Board, section	94	98
Decontamination:		
For biological and radiological agents	149	143
For chemical agents	148	142
General	147	142
Of ammunition	148	142

	Paragraphs	Page
Decontamination—Continued		
Of automotive equipment	148	142
Of instruments	148	142
Rough	149	143
Weapon	148	142
Definitions and terms	2	4
Deflection:		
Common, to set	45	66
In indirect laying	38	56
Qualification tests	176–180	160
To apply special corrections	46	66
To set or change	38	56
Destruction of equipment:		
General	151	145
Methods	153	146
Plans	152	145
References	154	146
Direction:		
Changing	90	90
Of fire, to mark	15	22
To fall in	9	13
To lay for	40	63
Disassembly, adjustment, and assembly of the weapon	138	137
Dismount	13	20
Dismounted posts	10	14
Displacement:		
Aiming post, to make correction	47	67
Corrections:		
For aiming posts	89	88
Qualification tests	181–185	163
Distant aiming point, method of boresighting	103, 104	104, 105
Drill:		
Safety precautions:		
General	158	148
Specific	159	148
Section:		
Instructions	8	12

	Paragraphs	Page
Drill—Continued		
Objective	7	12
Drivers, duties:		
Maintenance and inspection	141–146	138
Prepare:		
For action	16	22
For traveling	17	24
Duties, to assign with reduced personnel	32	53
Duties:		
Firing:		
Ammunition corporal	19	43
Artillery mechanic	19	43
Chief of section	21–36	49
Gunner	37–47	56
Individuals, general	20	48
No. 1	48–53	67
No. 2	54–57	69
No. 3	58–60	71
No. 4	61–63	73
No. 5	64–66	74
No. 6	67–69	74
No. 7	70–72	76
Inspection and maintenance:		
After operation	145	140
Before operation (march)	142	139
During halt	144	140
During operation (march)	143	139
Prior to and during firing	30	52
Weekly	146	140
Preparation for firing	15, 16	22
Preparation for traveling	17	24
Duties of personnel, general	6	10
Elevating, brake	51	68
Elevation (depression), mechanical	73	76
Elevation:		
To lay with quadrant	33	54
To measure	31	52

	Paragraphs	Page
Elevation—Continued		
To set	50	67
Elevation quadrant:		
Boresighting	102	103
Qualification test	191–195	167
Test and adjustment (basic periodic)	123–126	130
Comparison	126	131
Cross-level bubble	123	130
Mount alinement	124	130
Pivot vertical alinement	125	131
To cross-level	16, 49	22, 67
To lay for elevation with	50	67
Elevation, qualification tests:		
Laying for:		
With elevation quadrant	191–195	167
With gunner's quadrant	196–200	138
Measuring	206–210	171
End-for-end test	119	128
Equipment:		
Boresighting	96	99
Decontamination	147–150	142
Description	3	8
Destruction	151–154	145
Section	2	4
Sighting. (*See* Sighting and fire control equipment.)		
Errors. (*See* Mistakes.)		
Executive, battery, inspections	144	140
Fall in	9	13
Fall out	14	20
Fire:		
The gun	60	72
To give command	26	51
To indicate gun ready	25	50
Fire commands, to follow	24	50
Fire control and sighting equipment (*See* Sighting.)		
Fires, prearranged, to conduct	28	52

	Paragraphs	Page
Firing:		
Cease	92	95
Duties	19–72	43
Preparation for	15, 16	22
To resume, in another position	18	24
With reduced personnel	32	53
Firing and drill, safety precautions	158–160	148
Formations and commands, preliminary	9–14	13
Front (definition)	2	4
Functioning of material, to check	30	52
Fuze(s):		
Safety precaution	156	147
To attach to projectile	55	69
To remove from projectile	55	69
To set	55	69
Fuze setters, test	134–136	135
General duties of personnel	6	10
Gun (*See also* Material):		
Care and maintenance	142–146	139
Decontamination	148	142
Employment of term	2	4
Preparation for firing	16	22
Preparation for traveling	17	24
To fire	60	72
To indicate when ready to fire	25	50
To lay for direction	40	63
To lay for elevation	50	67
To load	19	43
To prime	59	72
To refer	43	64
To unload	83	83
Gun section, composition	5	10
Gunner, duties:		
General	6	10
In firing, indirect laying	37	56
In inspection and maintenance	141–146	138

	Paragraphs	Page
Gunner's quadrant:		
Qualification tests	196–200	168
Test of	118–122	127
To lay for elevation	33	54
To measure the elevation	31	52
Gunner's qualification test. (*See* Tests.)		
Halt, duties in inspection during	144	140
In battery (definition)	2	4
Incidents, unusual, to report	27	51
Indirect laying:		
Duties in firing. (*See also* Duties.)	19–72	43
Qualification tests, deflection only	176–180	160
Individual(s):		
Duties	20	48
Periods, minimum training	166	152
Qualification tests:		
Classification	174	159
Insert primer	59	72
Inspect the chamber	57	71
Inspection and maintenance	137–146	137
Duties:		
After operation	145	140
Before operation	142	139
During halt	144	140
During march	143	139
Weekly	146	140
Records	139	137
Responsibilities, battery and higher commanders	141	138
Instructions:		
Qualification tests	168–175	157
Section drill	8	12
Instruments. (*See* Sighting and fire control equipment.)		

	Paragraphs	Page
Latch pin, elevating speed control	52	68
Lay:		
For direction	40	63
For elevation:		
With elevation quadrant	50	67
With gunner's quadrant	33	54
Laying:		
Precision	86	85
Qualification tests:		
Deflection only	176–180	160
With elevation quadrant	191–195	167
With gunner's quadrant	196–200	168
Lanyard, to attach	60	72
Left (definition)	2	4
Level the trunnions. (*See* Trunnions.)		
Lines, vertical reference	91	93
List of duties. (*See* Duties.)		
Limbered (definition)	2	4
Load the gun	19	43
Loading trough. (*See also* Latch pin.)	16, 19	22, 43
Lock, primary recoil	74	76
Maintenance. (*See also* Inspections and maintenance.)	140	138
Maintenance, to perform in stabilized situations	145, 146	140
March order	17	24
Marks, boresight	107	107
Mask, to measure site	22	49
Qualification test	201–205	169
Materiel:		
Care and maintenance	140–146	138
Decontamination	147–150	142
Destruction	151–154	145
Disassembly, adjustment, and assembly	138	137
Observe functioning of	30	52
Qualification tests	216–220	177

	Paragraphs	Page
Manual operations	80	79
Measure:		
Elevation	31	52
Qualification tests	206–210	171
Site to the mask	22	49
Qualification tests	201–205	169
Mechanical, elevation (depression)	73	76
Micrometer test	120	129
Minimum training schedule	165–167	151
Misfires, safety precautions	157	148
Mistakes, to report	27	51
Mount, telescope:		
Test	127–133	131
To center bubbles on	41	63
No. 1 cannoneer, duties:		
General	6	10
In firing	19, 48	43, 67
In inspection and maintenance	142–146	139
No. 2 cannoneer, duties:		
General	6	10
In firing	19, 54	43, 69
In inspection and maintenance	142–146	139
No. 3 cannoneer, duties:		
General	6	10
In firing	19, 58	43, 71
In inspection and maintenance	142–146	139
No. 4 cannoneer, duties:		
General	6	10
In firing	19, 61	43, 73
In inspection and maintenance	142–146	139
No. 5 cannoneer, duties:		
General	6	10
No. 5 cannoneer, duties—Continued		
In firing	19, 64	43, 73
In inspection and maintenance	142–146	139
No. 6 cannoneer, duties:		
General	6	10
In firing	19, 67	43, 74
In inspection and maintenance	142–146	139

	Paragraphs	Page
No. 7 cannoneer, duties:		
General	6	10
In firing	19, 70	43, 74
In inspection and maintenance	142–146	139
Objective:		
Section drill	7	12
Training	162	150
Occupy position	15	22
Officer, safety	160	149
Operations manual	80	79
Ordnance check	115	125
Outline, qualification tests	175	159
Panoramic telescope:		
Care and maintenance	142, 145, 146	139, 140
Qualification tests	211–215	172
Tests and adjustment (boresighting)	95–114	99
Test (basic periodic)	132	134
Panoramic telescope mount:		
Care and maintenance	140, 145, 146	138, 140
Tests (basic periodic)	127–133	131
To center bubbles on	41	63
Parallax	106	106
Performance characteristics	3	8
Periodic tests, basic	115–136	125
Periods, individual training	166	152
Personnel:		
General duties	6	10
Reduced, to assign duties	32	53
Section (definition)	2	4
Pin, latch, elevating speed control	52	68
Pit, platform	76	77
Plumb line	97, 117	100, 127
Point, aiming:		
To indicate to the gunner	23	50
To set a common deflection on	45	66
Point, aiming, distant	87	86
Method of boresighting	103, 104	104, 105

	Paragraphs	Page
Points, aiming, and displacement corrections	89	88
Posts, aiming	88	86
Correction for displacement	89	88
Qualification tests	181–185	163
To make	47	67
To aline	44	64
To set out	16	22
Posts, section:		
Dismounted	10	14
Mounted	12	18
Prepared for action	10	14
To change	11	18
Powder chamber:		
Care and maintenance	142, 145, 146	139, 140
To place powder in	54	69
To swab	56	71
Powder charge:		
To load	54	69
To pass to No. 2	63	73
To prepare	19	43
To ram	65	73
Prearranged fires, to conduct	28	52
Precautions, fuze setters	136	136
Precautions, safety	155–160	147
Ammunition	156	147
Drill and firing	158–160	148
Fuze setters, scale test	136	136
Misfires	157	148
Precision:		
In laying	86	85
Standards, qualification tests	169	157
Preliminary commands and formations	9–14	13
Preparation(s):		
For firing	15, 16	22
For gunners' qualification tests	173	158
For traveling	17, 18	24

	Paragraphs	Page
Prepare:		
Charges	19	43
For action	16	22
To dismount	13	20
To mount	12	18
Prepared charges, to load	54	69
Primary recoil, locks	74	76
Prime the gun	59	72
Primer, to insert	59	72
Primer vent, to clean	56	71
Procedures for decontamination:		
For chemical agents	148	142
For biological and radiological agents	149	143
Projectile (*See also* Ammunition):		
To clean	55	69
To fuze	55	69
To ram	65	73
To unload	83	83
Quadrant, gunners. (*See* Gunner's quadrant.)		
Qualification of gunners. (*See* Tests.)		
Qualification scores	174	159
Radiological agents, decontamination	149	143
Radius point	107	107
Ram, the projectile	65, 80	73, 79
Rammer, method:		
Of bore cleaning	82	80
Of loading powder charges	66	74
Ready, to call	42	64
Ready to fire, to indicate when	25	50
Receptacle box	77	78
Recoil, primary locks	74	76
Record basic data, to	29	52
Records	139	137
Reduced personnel, assign duties to	32	53

	Paragraphs	Page
Refer the gun, to	43	64
Qualification tests	186–190	165
Reference lines, vertical	91	93
References:		
Decontamination	150	144
Destruction of equipment	154	146
General	4	9
Report mistakes	27	51
Responsibilities in inspections:		
Battery and higher commanders	141	138
Chief of section	141	138
Executive	141	138
Gun platoon commander	141	138
Resumes firing in another position	18	24
Right (definition)	2	4
Safety officer	160	149
Safety precautions:		
Ammunition	156	147
Drill and firing	158–160	148
General	155	147
Misfires	157	148
Scales, test and adjustment:		
Elevation	102	103
Time	135	135
Schedule, minimum training	167	153
Scores, qualification tests	174	159
Scoring, qualification tests	172	158
Scribed lines	112	118
Section:		
Composition	5	10
Definition	2	4
Drill	7–14	12
Instructions	8	12
Objective	7	12
Section	9–13	13
Duties. (*See* Duties.)		
Section data board	94	98

	Paragraphs	Page
Set, to:		
Deflection	38	56
Elevation	50	67
Fuzes	55	69
Fuze setter	55	69
Set, to call	53	69
Set out aiming posts	16	22
Setters, fuze, test	134–136	135
Setting time fuzes	55	69
Sight, to zero	39	58
Sighting and fire control equipment:		
Boresighting	95–114	99
Care and maintenance	142–146	139
Decontamination	148, 149	142, 143
Tests and adjustments	95–133	99
To verify adjustment	34	55
Qualification tests	211–215	172
Zero the sight	39	58
Signals	78	78
Site to mask, to measure	22	49
Qualification tests	201–205	169
Special corrections, to apply to deflection	46	66
Standard(s):		
Angle method of boresighting	111–114	117
Of precision	169	157
To be attained	164	151
Swab out bore,	35	55
Table:		
Duties in firing (table III)		
Duties in preparing for action (table I)		
Duties in preparing for travel (table II)		
Duties in inspection and maintenance (table IV)		
Target, testing. (*See also* Testing target)	91	93

	Paragraphs	Page
Telescope, panoramic:		
Care and maintenance	142, 145, 146	139, 140
Test (basic periodic)	132	134
Qualification tests	211–215	172
Tests and adjustment (boresighting)	95–114	99
Telescope mount, M30:		
Care and maintenance	140, 145, 146	138, 140
Qualification test	211–215	172
Tests (basic periodic):		
Cross-level	129	133
Pivot alinement	130	133
Socket alinement	133	134
Vertical alinement	131	134
Terms and definitions	2	4
Testing target	91	93
Testing target method, boresighting	99–102	101
Tests:		
Basic periodic	115–136	125
Elevation quadrant	123–126	130
Fuze setter	134–136	135
Gunner's quadrant	118–122	127
Panoramic telescope	95–114	99
	127–133	131
Panoramic telescope mount	127–133	131
Tests for qualification of gunners	168–220	157
Assistance	170	158
Displacement correction	181–185	163
General instructions	168–175	157
Indirect laying	176–180	160
Laying for elevation with:		
Elevation quadrant	191–195	167
Gunner's quadrant	196–200	168
Materiel	216–220	177
Measuring:		
Deflection	186–190	165
Elevation	206–210	171
Site to the mask	201–205	169
Outline of tests	175	159

Tests for qualification of gunners—Continued		
Purpose and scope	168	157
Sighting and fire control equipment	211–215	172
Time	171	158
Time scale test, fuze setters	135, 136	135, 163
Timesavers	81	80
Tools, equipment	96	99
Training:		
Conduct	163	150
Minimum schedule	165–167	151
Objectives	162	150
Purpose and scope	161	150
Standards to be obtained	164	151
Transit, instead of plumb line	85	84
Traveling, preparations	17	24
Trough, loading. (*See also* Latch pin.)	16, 19, 54	22, 43, 69
Trunnions, leveling:		
For basic periodic tests	116	126
For boresighting	97, 108, 109	100, 114, 116
Telescope mount test	127–133	131
Turntable	75	77
Turntable, anchors	79	78
Unit:		
"A" (definition)	2	4
"B" (definition)	2	4
Unlimbered (definition)	2	4
Unload the gun	83	83
Vent, primer, to clean	56	71
Vertical reference lines	91	93
Weekly inspection and maintenance	146	140
Winching:		
Into battery	16	22
Into battery, breech uphill	84	83
Out of battery	17	24
Out of battery, breech downhill	84	83

[AG 472.2 (19 May 54)]

BY ORDER OF THE SECRETARY OF THE ARMY:

M. B. RIDGWAY,
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Chief of Staff.

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6–501A, Hq & Hq Btry, Corps Arty or Abn Corps Arty (2)

NG: None.

USAR: None.

Unless otherwise noted, distribution applies to CONUS and overseas.

For explanation of abbreviations used, see SR 320–50–1.

FIELD MANUAL

280-MM GUN T131 ON CARRIAGE T72

FM 6–96
CHANGES NO. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *1 August 1962*

FM 6–96, 9 July 1954, is changed as follows:

74. Primary Recoil Locks
(Superseded)

Immediately after the tube is winched into battery and prior to elevating or firing the gun, the chief of section will verify that the primary recoil locks are fully locked.

a. Check that the pointers on the primary recoil locks are alined with the locked indexes.

b. Check that the locating pin is seated in the locked position locating notch.

c. Check that the locking pins are fully set in the deep notches in the pin housing.

d. Insert the primary recoil lock feeler gage (shoehorn) into the smooth section of the interrupted locking nut thread. Full insertion of the feeler gage indicates that the tube is secured to the recoil mechanism.

Warning: **Failure to observe these procedures may result in firing the gun before it is secured to the recoil mechanism which will result in destruction of materiel, and possible loss of life.**

3000015738

BY ORDER OF THE SECRETARY OF THE ARMY:

G. H. DECKER,
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USA Corps (3)
Units org under fol TOE:
6-535 (10)

NG: State AG (2).

USAR: None.

For explanation of abbreviations used, see AR 320-50.

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Table I. Duties of Gun Section Personnel in Preparing for Action

Sequence	Chief of section	Gunner	Assistant Gunner (No. 1)	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Ammo Cpl / Sr Ammo Handler / Ammo Handler	Arty Mecb	Gen Op	"A" Unit Driver	Asst "A" Unit Dr	"B" Unit Driver	Asst "B" Unit Dr
1	Commands PREPARE FOR ACTION. Directs work of all section personnel throughout all sequences.	Remove cover.								Under supervision of ammunition corporal, prepare ammunition as directed.	Performs before-firing inspection.	Assists in uncoupling generator trailer.		Moves to position convenient for operating hydraulic system.		Removes muzzle cover. Dismounts to position convenient for signaling rear driver.
		Receives intercom cord from No. 6. Caps and returns to No. 6. Rotates turn-table, assisted by No. 1 (fig. 9).	Assists gunner rotate turntable. Inspects rear jack to insure a minimum of 4 inches clearance.	Receives intercom cord from No. 4, caps, and returns to No. 4.		Turns off left rear emergency valve and disconnects bose, secures in dummy retainers. Disconnects intercom cord and passes it to No. 2. Receives intercom cord from No. 2 and secures it in retainer.	Disconnects right rear service and accelerator hoses. Secures in retainers.	Lowers ladder. Disconnects intercom cord (fig. 10), passes it to gunner and secures it after gunner caps it. Turns off left front emergency valve. Disconnects hose (fig. 11) and secures in dummy retainer.	Lowers ladder. Turns off right front service and accelerator valves, disconnects hoses and secures in retainers.							
2		Insures that left front shackle is hooked under lifting hook.	Insures that right front shackle is hooked under lifting hook.	Insures that left rear shackle is hooked under lifting hook.	Insurea that right rear shackle is hooked under lifting hook.	Removes left rear wedge fastening key (fig. 12).	Removes right rear wedge fastening key.	Removes left front wedge fastening key.	Removes right front wedge fastening key.							
3	When Nos. 1 and 3 have reported "Ready," signals "Lift" to "B" unit driver and assistant "A" unit driver.	Assists No. 6 in removing left front wedge.	Assists No. 7 in removing right front wedge.	Assists No. 4 in removing left rear wedge (fig. 13).	Assists No. 5 in removing right rear wedge.	Assisted hy No. 2, removes left rear wedge (fig. 13).	Assisted by No. 3, removes right rear wedge.	Assisted by gunner, removes left front wedge.	Assisted by No. 1, removes right front wedge.					Applies upward pull on both hydraulic lifts on signal from CS.	Applies upward pull on hoth hydraulic lifts on signal from CS.	
4	Checks to insure all is clear under gun. Signals assistant "A" unit driver to lower gun to approximately 6 inches above ground. Wben Nos. 4 and 5 indicate they are ready, signals "B" unit driver and assistant "A" unit driver to lower gun to the ground (fig. 15).					When rear float is lowered to 6 inches from ground, disengage left and right traveling locks on rear float, place arms in "down" position. Signal when clear (fig. 14).								On signal from CS, lowers rear of gun to within 6 inches of ground. When rear float locks have been unlocked and on signal of No. 5, lowers gun to ground.	On signal from CS, lowcrs front of gun to ground.	
5		Assisted hyNo. 2, folds left platforms to firing positlon.	Assisted by No. 3, folds right platforms to firing positlon.	Assists gunner in folding left platforms to firing position.	Assists No. 1 in folding right platforms to firing position.			Unhooks left front shackle. Attaches shackle to transporter.	Signals assistant "B" unit driver to have shackles lowered and/or raised. Unbooks right front shackle (fig. 16). Attaches shackle to transporter (fig. 17).						On signal of assistant "B" unit driver, lowers and/or raises sbackles.	On signal of No. 7, signals "B" unit driver to lower and/or raise shackles.
6						Assists the assistant "A" unit driver in disengaging winch cahle.		Places left lifting fork guide in unlimhered traveling position.	Places rigbt lifting fork guide in unlimhered traveling positlon.					Assisted hy No. 4 unreels winch cahle.		
				Pass winch cable forward to hreech where No. 3 places it in retracting sheave and No. 2 fastens cable end to front hreech ring pulling eye (fig. 18) and signals "Ready" to CS.												
7	When Nos. 2, 4, and 5 have signaled "Ready," insures that all personnel are clear of tube. Checks that primary recoil rod locks and safety locks are in the unlocked position. Signals assistant "A" unit driver to winch tube into firing position (fig. 20).				No. 5, assisted hy Nos. 3 and 4, takes pins out of rigbt and left retraction stops (fig. 19). Inserts pins in retraction stops when tube has heen winched forward.									On signal from CS, winches, tuhe into firing position.	Backs up a short distance (ahout 3 feet). Raises the lifting forks to clear the carriage. Guided by assistant driver, moves transporter away from gun.	Guides "B" unit driver away from gun.
8	Verifies that right and left piston recoil rod locks are secure.			Locks left piston recoil rod lock (fig. 21).	Operates turnbuckle if needed to facilitate locking recoil rod locks. Locks right piston recoil rod lock. Detaches and secures turnhuckle if used.											
9	Verifies that all electrical switches are in the off position.	Places panoramic telescope in mount.	With handwheel, assists Nos. 6 and 7 in disengaging cradle locks. Presses OFF button to lnsure power elevation is off.	Disconnect winch cable and pass it back to No. 4 wbo assists assistant "A" unit driver in securing it on drum.				Unlocks left cradle traveling lock (fig. 22).	Unlocks rigbt cradle traveling lock (fig. 22).					Guides winch cahle hack on drum and secures.		
10			Cross-levels gun with gunner's quadrant, assisted hy Nos. 6 and 7 on cross-leveling jacks (fig. 24).	Assisted hy No. 3, secures loading trough in firing positlon, checks that safety catch is engaged. Closes platform cover.	Assists No. 2 to secure loading trough in firing position.	Unhooks left rear shackle and secures to "A" unit transporter. Secures left lifting fork guide in unlimhered traveling position (fig. 23). Signals "Clear."	Signals assistant "A" unit driver to lower and/or raise shackles Unhooks right rear shackle and secures to "A" unit transporter. Secures right lifting fork guide in unlimhered traveling position (fig. 23). Signals "Clear."	Operates left cross-leveling jack as directed hy No. 1 (fig. 25).	Operates right cross-leveling jack as directed by No. 1.		Plugs generator transmission cable into gun receptacle box (fig. 26).			On signal of No. 5, lowers and/or raises shackles.		
11	When Nos. 4 and 5 signal clear, signals "A" unit transporter away from gun.		Assisted hy No. 7, elevates tuhe manually to at least 5°, calls "Power." Tests power elevating mechanism to above 11°, returns to 11° (fig. 27).	Assisted by No. 3, opens hreech (fig. 28) and inspects bore and chamber. Places loading trough in loading position.	Assists No. 2 in opening breech (fig. 28) and placing loading trough in loading position.	On command, turns on power, places loading davit in firing position.		Assembles aiming posts.	Assists No. 1 in elevating tuhe manually to at least 5°.				On signal of CS moves forward a sbort distance (about 3 feet).	Raises the lifting forks to clear carriage.		
12	Inspects functioning of rear float traversing mechanism. Signals to gunner wben back on center of traverse.	Tests traversing mechanism. Alines aiming posts if directed (fig. 29).					Calls "Power on." Exercises power rammer.	Sets out aiming posts if directed hy gunner.					On signal of assistant driver, moves transporter away from gun.	Guides "A" unit driver away from gun.		

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